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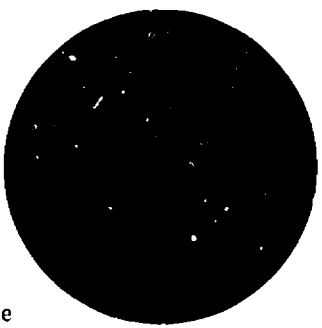
ABSTRACT

This Bulletin, published bimonthly, reports the current literature in the areas of science, engineering, technology, and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose is to aid such individuals by alerting them to new additions to the science policy literature. The information presented consists primarily of a bibliographic listing of current publications in the area, together with an abstract of each publication. The bibliographic information is presented under a number of topical categories. The categories are (1) general, (2) science, domestic problems, and national goals, (3) needs and allocation of resources for science, (4) national R and D programs, (5) science, education, and the university, (6) science management and policy-making bodies, (7) science, foreign affairs, and national defense, (8) multinational science policy, and science policy abroad. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation. (RR)



Battelle Memorial Institute

Science Policy Bulletin

Volume 3 • Number 6 • December 1970

Science Policy Bulletin reports the current national and international literature in the area of science and public policy, encompassing both "policy for science" and "science for policy" matters. For brevity, the word "Science" in the title of the Bulletin is used to denote engineering and technology as well as science.

The Bulletin is intended for individuals and organizations engaged in studying, formulating, or implementing public policy relating to science and its applications. The Bulletin consists principally of summaries of the cited literature. These précis are grouped in selected topical categories; cross-indexing is not used.

The literature reported by the Bulletin includes books, reports, and periodical articles. The regularly screened periodicals are listed on the inside back cover. The focus of the literature reported is on matters of broad public policy; literature of a highly technical and narrowly specialized nature is not included.

Science Policy Bulletin

Volume 3 • Number 6 • December 1970

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ABOUT THIS ISSUE

High on the list of reader suggestions for changes that would make the Bulletin more useful was an Annual Index. I wanted badly to blurt this planned addition in my last note, but, recognizing the possible "slip twixt cup and lip", I refrained. This issue, I am pleased to report, has an index for Volume 3. While we recognize that an index for Volumes 1 and 2 might be useful, we have determined that our efforts should be directed toward improving future issues, rather than trying to remedy deficiencies of past issues. We trust our readers will agree.

So that none of you will be tempted to the conclusion that we are again slipping our schedule, let me advise you that we will become a quarterly in 1971. Hence, Volume 4/Number 1 – covering January, February and March – will make its appearance in April 1971. Our staff has concluded that this additional month will provide more time, and hence more perspective in preparing our abstracts/precis/reviews, as well as in selecting the material to be reviewed.

In 1971, we will begin to feature interpretive and correlative reviews covering our major topical categories. We plan to occasionally reprint particularly pertinent articles from other publications. In this spirit, we are going to attempt to *review* rather than just *abstract* the literature. We recognize the value of source and reference material, and will continue to provide bibliographic coverage. This somewhat altered approach suggests that our publication will be different in 1971 – sufficiently so that we'll also change its name from *Science Policy Bulletin* to *Science Policy Reviews*. / CRT

1000 GENERAL

1059. *Toward a Science Policy for the United States,* **Report of the Subcommittee on Science, Research, and Development to the Committee on Science and Astronautics, U.S. House of Representatives, 91st Congress, 15 October 1970, 115 pp.** This report is divided into 3 parts: (1) an introductory section delineating the need and specific recommendations for a clear national science policy; (2) highlights of testimony by over 60 witnesses at science policy hearings held by the Subcommittee last summer; and (3) a history of U.S. science policy from 1787 to the present. Subcommittee chairman Daddario, in his transmittal letter, states that "the Nation has no formalized science policy to guide it". The report makes 18 pointed recommendations toward rectifying this shortcoming. These include the establishment of an Office of Technology Assessment and the creation of a centralized jurisdiction over science and technology in the Senate. Prompt inauguration of NIRAS – National Institutes of Research and Advanced Studies (proposed earlier by the Subcommittee) – is urged. NIRAS would be responsible for the coordination and administration of about 60 percent of all Federally supported basic research. Another recommendation is that a new, high-level task force be created by the administration to draft a master plan for a national science policy to be submitted to Congress by 31 December 1971. The report also urges beefing up the present Office of Science and Technology and freeing it from its ties with the President's science adviser and the Science Advisory Committee which he heads. (This report may be obtained by writing to House of Representatives, Committee on Science and Astronautics, Washington, D.C. 20515.)

1060. **McElroy, W. D., "Scientists Must be More Agressive",** *Chemical & Engineering News,* **v. 48, no. 49, 23 November 1970, pp. 25-27.** A general discussion of science policy and opinions on future projects are presented by the Director of the National Science Foundation. He observes that our science policy in the past "has been a social-political decision" and that the "big" money going into science "was a post-Sputnik response – not a scientific decision". McElroy suggests that scientists and scientific societies should be more active in educating the public and that industry should help fund groups to study local problems. He feels that funding levels have fallen as low as they can, and any further drops would seriously endanger the future of research. In his opinion, permitting the NSF to support about 40 percent of the basic science research would prevent large fluctuations in the system. He also feels that the "DOD *has* to stay in a position to support basic research". New programs by NSF must be funded with "add-on money – not redirected money". An area of future research which Dr. McElroy considers promising is applied biology. He believes that industry should be involved in "the big

societal problems", and is setting up an advisory group of industrially oriented people to recommend the types of research NSF should be supporting.

1061. *The Role of Science and Technology in Economic Development,* **Science Policy Studies and Documents, No. 18, United Nations Educational, Scientific and Cultural Organization, Paris, France, 1970, 216 pp.** Conclusions of a joint Unesco-IEA (International Economics Association) meeting of specialists on the role of science and technology in economic development are presented, along with the texts of nine invited background papers by experts from assorted countries. The purpose of the meeting was to define and stimulate research on relevant problems among Unesco's Member States and to guide Unesco's operations, particularly in developing countries. Separate discussion summaries are presented for each of the three topics that formed the basis of the meeting: (1) Science Policy and Economic Development, (2) Methods of Integrating Scientific and Economic Planning into Overall Planning, and (3) Problems and Methods of Financing Scientific and Technological Research. Each of the background papers is directly pertinent to at least one of these topics. Subjects include contributions of science to economic development, integrated scientific and economic planning, effects of government and industrial R&D strategies and progress on national economy, and problems and methods of financing scientific and technical research. Four of the papers deal with the last topic (financing) – a general treatise, one on the socialist countries (Bulgaria, Czechoslovakia, East Germany, Poland, Rumania, Hungary, and the USSR), one on Japan, and one on India. (For sale by the Unesco Publications Center, P.O. Box 433, New York, N. Y. 10016. Price: $4.00.)

1062. **Drucker, P. F., *Technology, Management & Society*, Harper and Row, New York, 1970, 212 pp. ($5.95).** The book consists of 12 essays written over the past 10 years. Topics include the changing role of management; business management as a science; understanding the information explosion; and studies of technology, science, culture, and society. The author notes in Essay 11 that science "was transformed by the emergence of systematic technology", changing science from "natural philosophy" to a "social institution". Parallel histories of culture and the emergence of technology as a distinct field are traced, and the author notes that "technology is important today precisely because it unites both the universe of doing and that of knowing".

1063. **Wallia, C. S. (Ed.), *Toward Century 21. Technology, Society, and Human Values*, Basic Books, Inc., New York, 1970, 318 pp. ($8.95).** Material compiled by Stanford University's "Technology and Human Values" lecture-series project conducted in 1968 is presented. The

text is divided into five categories: (1) Biopsychological Perspectives, (2) Science and Creativity, (3) Technology and Economic Development, (4) the Political System, and (5) Humanistic Perspectives. General problem areas discussed in the book include the preservation of ethical and human values amidst an expanding technology, the definition of goals for the application of man's increasing mastery of his environment, the determination of the social responsibilities of professional scientists, and the delineation of aspects of man's cultural heritage which are applicable to modern and future society. Editor Wallia proposes a university program of biopolitical science. In his words, "such a program could provide knowledge of the complexities of ecology and also the functions and limitations of various political processes and institutions. Changes are needed in the existing political system of the traditional politician catering to the pork barrel of massive technology contracts... It would be a suicidal oversight to let technology become prepotent over ecology. The urgent need for efforts toward preserving human values in our technological society cannot be overstated." 1064.

1064. *Technology and the Individual,* Research Review No. 6, Harvard University Program on Science and Technology, 1970, 62 pp. This research review "covers literature on the effects of technology and the individual in modern society – his psychology and life style". The literature is divided into two categories: (1) Technology, Social Structure, and the Individual; and (2) Technology, Culture, and the Individual. In an introductory treatise, man's power over the environment and himself is examined with respect to various concepts of freedom in a highly technological society. Prudent development of new technology is recommended – even blocking any technological development that poses a threat to man's well-being. The second part of the review deals with the effects of technology on human values. The effects are attributed to the methodologies associated with technical progress. Machine civilization is of special concern, and "untutored acceptance" of such a civilization is seen as dangerous. Abstracts of the literature surveyed are presented by category, and each group is preceded by a general summary of the viewpoints expressed in the references given. (Report available from Harvard University Press, 79 Garden St., Cambridge, Mass. 02138. Price: $2.00.)

1065. *Background Readings, Midwest Regional Conference on Science, Technology, and State Government,* Sponsored by the National Science Foundation, Department of Health, Education, and Welfare, and State of Illinois, Arlington Heights, Illinois, 17-19 November 1970, 140 pp. Eight papers comprise this report, which was prepared as a preliminary reference document to familiarize conference participants with the theme, "Achieving Environmental Quality in a

Developing Economy". Conference director Stephen Gage notes that "the midwest does lag much of the rest of the country in the recognition and articulation of problems resulting from or amenable to solution by science and technology". The papers encompass the following general topics: (1) the role of economic and technology assessment in environmental problems; (2) the role of universities and research institutions in achieving environmental quality; (3) government and industrial program planning and financing; (4) the effects of environmental protection policies on economic development; and (5) the impact of science, technology, and public policy on urban and rural economic growth. Findings from the conference are intended to provide guidelines at all levels of government toward more effective use of science and technology in solving public problems, specifically those involving environmental quality. Proceedings of the conference will be published. (For availability information, contact Dr. S. J. Gage, Conference Director, Illinois Board of Higher Education, 160 N. LaSalle St., Chicago, Ill. 60601.)

1066. *Index to Literature on Science of Science,* **Research Survey & Planning Organization, CSIR, v. 6, nos. 5 and 6, May and June 1970, 31 pp.** This briefly annotated bibliography contains 182 references to literature published during 1969 in 30 Indian journals. Categories are as follows: General, Agriculture, Automation, Defence, Education, Management, Manpower, Planning, Policy, Foreign Collaboration, Society, Economic Development, Industry, Organisation, and Trade. (The Index may be obtained from the Research Survey and Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

1067. *Index to Literature on Science of Science,* **Research Survey & Planning Organization, CSIR, v. 6, nos. 7 and 8, July and August 1970, 52 pp.** Twenty-six American and foreign journals are represented in this 278-reference bibliography of literature that appeared in the last half of 1969. The briefly annotated entries are grouped in the following categories: General, Agriculture, Computer, Education, Expenditure, Manpower, Planning, Management, Politics, Policy, Foreign Collaboration, Organisation, Industry, and Society. (The Index may be obtained from the Research Survey and Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

2000 SCIENCE, DOMESTIC PROBLEMS AND NATIONAL GOALS

ENVIRONMENTAL PROBLEMS

2090. Jacoby, N. H., "The Environmental Crisis", *The Center Magazine*, v. III, no. 6, November/December 1970, pp. 37-48. Forces creating environmental degradation are identified and discussed: (1) population concentration, (2) rising affluence, and (3) technological change. A number of suggested remedies (socialization of the economy, zero growth, austerity, and reordering of public spending priorities) are shown to be unsatisfactory. Jacoby believes that pollution can be controlled only by governmental action "to bring about the reallocations of resources needed for environmental improvement . . . [and] to levy the costs of such improvement equitably among individuals and groups in society". In our competitive market system, he points out, neither the corporations creating polluting products nor the private users of these products would be willing to shoulder the extra cost of pollution control without governmental intervention. Noting that "the environmental crisis was generated primarily by tardy responses of the political system and only secondarily by faults in the market system", Jacoby recommends specific reforms in both systems so that their actions "will more rapidly and accurately reflect significant shifts in social values". Finally, he points out that the tens of billions of dollars to be spent on environmental improvement from now on will entail profound changes in cost-price-production-consumption patterns, with a net upgrading of "the well-being of American society".

2091. Weidenbaum, M. L., "How to Buy A Cleaner Environment", *Bulletin of the Atomic Scientists*, v. XXVI, no. 9, November 1970, pp. 19-21. The tremendous cost of pollution control is discussed. Projected Federal government outlay for 1971 is $1.1 billion, almost double the 1970 outlay. The author suggests that instead of concentrating on the growing costs of cleanup, more emphasis should be placed on "adopting methods of producing and consuming which are less polluting than our present practices". He further points out that "we need to attach some form of economic disincentive to the creation of pollution"; and effective government standards and enforcement will be necessary. Also, trade-off studies are needed to determine "where the costs begin to exceed the benefits" of government spending on pollution control.

2092. Epstein, S. S., "Control of Chemical Pollutants", *Nature*, v. 228, no. 5274, 28 November 1970, pp. 816-819. Inadequacies of testing chemical pollutants are discussed, and a number of reforms recommended. These include (1) data on efficacy, chemical identity,

toxicology, monitoring, and epidemiology of chemicals should be collated and distributed nationally and internationally; (2) expanded facilities and multidisciplinary training and environmental research programs should be instituted in university, federal, industrial and independent laboratories; (3) new legislation should be enacted and existing legislation enforced, relating to criteria that must be met before any new synthetic chemical or other pollutant could be released to the environment; (4) "protocols for testing [chemicals] should be published in the *Federal Register*, and be subject to periodic review"; and (5) a new interdisciplinary agency that is "scientifically and legally responsive to a broad range of consumer interests" should be given "ultimate responsibility for all problems of environmental quality and consumer protection".

2093. **"Disunity on Solution"**, *Chemical & Engineering News*, v. 48, no. 49, 23 November 1970, p. 10. Two keynote speeches were presented at the Midwest Regional Conference on Science, Technology, and State Government (see Abstract 1055): One by Dr. Albert H. Cox, economist, and one by Ralph Nader. Cox maintains "that pollution control and economic growth are not incompatible". He suggests the imposition of "effluent" charges, where industries pay the government for the right to pollute rather than be compelled by government action to clean up. Nader maintains that pollution is a legal problem as well, and recommends (1) "environmental receiverships" for pollution offenders, in which government trustees "would divert all profits to pollution control"; (2) vesting the authority to grant corporation charters in the Federal government, which could impose antipollution requirements as part of the charter conditions; (3) requiring suspected polluters to carry the burden of proof with regard to public health; and (4) "giving citizens 'initiatory rights' to sue for relief from pollution".

POLLUTION – SOLID WASTES

2094. **"New Solid Waste Recovery Act Becomes Law"**, *Environmental Science and Technology*, v. 4, no. 11, November 1970, p. 881. "The Resource Recovery Act of 1970 includes funds, for the first time, for the construction of improved solid waste disposal facilities and demonstration of area-wide resource recovery systems. Sponsored by Rep. Paul G. Rogers (D.-Fla.) in the House and Sen. Edmund S. Muskie (D.-Me.) in the Senate, the new law authorizes $80 million for fiscal year 1972 and $140 million for fiscal 1973 for such construction and demonstration grants. The law also established the National Commission on Materials Policy, which was offered by Sen. J. Caleb Boggs (R.-Del.). The commission is authorized $2 million and will report by June 30, 1973. Also, Bureau of Mines is authorized $51.25 million for fiscal years 1971-73 for research in metal and minerals solid waste disposal problems."

2095. **Golueke, C. G., et al.,** *Solid Waste Management: Abstracts and Excerpts from the Literature,* **Volumes 1 and 2, U.S. Department of Health, Education, and Welfare, Public Health Service, Environmental Health Service, Bureau of Solid Waste Management, PHS Publication No. 2038, 1970, 455 pp.** Over 700 individual abstracts of papers, articles, and reports compiled at the University of California in connection with a research program on solid wastes management are presented. This reference is really two reports bound together – one (308 pp.) covering 15 years' accessions through June 1968, and the other (147 pp.) extending the coverage to July 1969. The large number of abstracts for 1968-69 compared with the number for the preceding 15 years is a reflection of the recent burgeoning of literature in the field. Abstracts are presented chronologically within each of the subcategories under the following major categories: Management, Collection and Transport, Disposal, Reclamation (Recycling), Environmental and Public Health, Pollution, and Agricultural and Food Processing Wastes. Each volume is indexed by personal author, corporate author, and subject. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: $4.00.)

POLLUTION – AIR

2096. **"Implementation Plans: Gut Issue for Air Quality",** *Environmental Science & Technology,* **v. 4, no. 11, November 1970, p. 897.** State implementation plans for controlling only SO_2 and particulate emissions in the first 13 Federally designated air quality control regions (involving 15 states and the District of Columbia) were due in September 1970. Other pollutants to be controlled will be included later. As of November 1970, 16 implementation plans submitted to the National Air Pollution Control Administration (NAPCA) were under review; none had yet been approved. Each plan must contain at least the following items: (1) emissions inventory, (2) air-quality data, (3) control regulations, including timetables for enforcement, (4) emergency episode authority and procedures, (5) a surveillance system, including an air quality monitoring network, (6) legal authority to take action, and (7) manpower and financial resources. Biggest stumbling blocks are noted as being the necessary state regulations to enforce the plan. Manpower and money also present problems. While 1975 is the unofficial target for clean air, NAPCA hopes for some actions that can be achieved in 1 or 2 years.

2097. **Black, G.,** *Energy, Air Quality, and the System Approach,* **Staff Discussion Paper 104, Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C., July 1970, 89 pp.** "This study is an analysis of the implications for 1) national energy and fuel resource policy and 2) air pollution policy, the means by which national goals which are dependent on

the use of energy, such as economic growth, can be achieved simultaneously with air quality goals. Since the overwhelming portion of air pollutants are the by-product of energy generation, changes in the mix of pollutants which result from alterations in fuel, means of energy conversion, or pollution abatement are of major air quality significance. Special attention is given to sulfur oxides and particulates. The basic energy model is derived from the Department of Commerce inter-industry study (input-output table for 1963), from engineering data on: power generation, pollution abatement, and vehicular power. The pollution model combines an emitter model, a diffusion model, and a recipient model. The overall model merges the energy and the pollution model so as to permit a comparative analysis of alternative programs, with respect to costs, air quality and technology." (The report can be obtained from the National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)

2098. **Nehls, G. J., Fair, D. H., and Clements, J. B., "National Air Data Bank Open for Business"**, *Environmental Science and Technology*, **v. 4, no. 11, November 1970, pp. 902-905.** A computer system to handle pollution data has been designed and will operate in conjunction with the National Air Pollution Control Administration's National Aerometric Data Bank to define and monitor air quality conditions. The article contains a description of the SAROAD system (Storage and Retrieval of Aerometric Data) and discusses further development of the system. "The National Aerometric Data Bank channels valid aerometric data among federal, state, and local agencies." Data summaries will alleviate problems of manual data reduction, and within 3 to 5 years, standard programs and routines will be available from NAPCA to enable less highly trained computer personnel to process routine data. Additional planned information services will provide episode monitoring capability. The system will provide the necessary air quality data on a continuing basis to guide public and private decision makers in formulating legislation and control efforts.

POLLUTION – WATER

2099. **Halladay, W. B., "Industrial Waste Treatment – Fact and Fiction"**, *Journal of the Water Pollution Control Federation*, **v. 42, no. 11, November 1970, pp. 2004-2008.** "There are many misconceptions about the efforts of industry to control water pollution, and this paper attempts to separate the facts from the fictions of this subject. Industrial participation in hearings to establish water quality standards under the Water Quality Act of 1965 made industry aware of the necessity of pollution control programs. These programs are progressing but are hampered by lack of financing and the need for

new technological breakthroughs. Some of the fictions that the author refutes are that industry creates most pollution, that the nation is running out of water, that industry has all necessary techniques to clean up water, and that different types of pollution can be attacked piecemeal. The strong and weak points of the federal guidelines for water pollution control are discussed."

2100. "Slow Slogging on Sewage", *Science News*, v. 98, no. 22, 28 November 1970, p. 412. "Of all pollution-abatement procedures, sewage treatment has by far received the largest share of Federal attention and funds. A central feature of President Nixon's pollution-control package proposed to Congress earlier this year was a $10 billion program for sewage treatment, and funds appropriated for the purpose under earlier programs hit a record $1 billion for the current fiscal year. And although construction of sewers and treatment plants has lagged behind the new needs created by a growing urban population, the corner is beginning to be turned now, says Ralph C. Palange, head of the Federal Water Quality Administration's sewage construction grants program... Sewage treatment goals apparently have to be met by patient slogging and use of tried and true techniques, rather than through technological breakthroughs... Whatever happens in sewage treatment technology, the large infusions of money still appear to be the only sure answer."

2101. "Water Polluters: Beware the Feds!", *Environmental Science & Technology*, v. 4, no. 11, November 1970, pp. 887-889. Ways of enforcing water-pollution regulations at the federal level are discussed. The 1899 Refuse Act controls dumping in navigable waters, and two other enforcement methods from the Federal Water Pollution Control Act provide either long notification periods (180 days) or lengthy procedures before court action can be taken. Of the three, the late 19th century Refuse Act "is the fastest remedy under the law". Enforcement is further "hampered and limited by statutory authority, which ties the federal government's hands for at least one year... before a recalcitrant polluter can be brought to terms". These deficiencies may cause serious losses in water quality, and the article's author looks to the 92nd Congress to amend the situation. Examples of actions taken are cited, and water pollution enforcement conference activities are discussed (51 have been held or scheduled as of November).

2102. "New Oil Discharge Rules", *BioScience*, v. 20, no. 22, 15 November 1970, p. 1212. "New regulations for controlling water pollution caused by oil discharges have been put into effect by the federal government. The new regulations, which were first published in the 24 July *Federal Register*, prohibit discharges of oil which violate applicable water quality standards or which cause a film or

sheen upon or discoloration of the surface of the water or adjoining shorelines or which cause a sludge or emulsion to settle beneath the surface of the water or upon adjoining shorelines. The regulations apply to discharges of all vessels and all offshore and onshore facilities into navigable waters of the United States (including ocean waters within 3 miles of the coastline). They also apply to discharges by vessels in the contiguous zone, an area seaward of the 3-mile zone out to a distance of 12 miles from the coastline. Personnel in charge of a vessel or facility from which a prohibited discharge originates are required to notify the Coast Guard immediately, or face a penalty of up to $10,000 and one year in jail. The owner or operator may also be held liable to the U.S. government for the costs of cleaning up the discharged oil."

2103. "Ocean Pollution", *Science,* v. 170, no. 3960, 20 November, 1970, p. 836. "President Nixon plans to ask the next Congress for laws governing ocean dumping, which are suggested in a report, released last month, by his Council on Environmental Quality. The report cites a "critical need" for a national policy on ocean dumping, calls for an immediate ban on dumping of toxic wastes, and proposes regulations governing all dumping in the oceans, estuaries, and Great Lakes. The bulk of dumped matter consists of dredge spoils – muck from harbor and river bottoms containing industrial, municipal, and other pollutants. Other debris comes from industrial wastes, sewage sludge, construction debris, solid waste, explosives, and radioactive waste. The report, 'Ocean Dumping: A National Policy', can be obtained for 55 cents from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402."

ENERGY CRISIS

2104. Seaborg, G. T., "Survey of the U.S.A.", *Nuclear Engineering International*, v. 15, no. 174, November 1970, pp. 897-898. The role of nuclear energy in helping to meet the growing power demands is presented by the Chairman of the U.S. AEC. The need for research and development is stressed and five areas of future action for the nuclear industry are defined: (1) "the energy community must 'make good' on the heavy commitment to those large electric generating plants already on order to ensure the availability of adequate electric power", (2) essential to the breeder reactor program is "timely" success with large light-water reactors, (3) the energy industry must demonstrate that "it has weighed the many options and has selected those that minimize the impact on the environment", (4) "the industry should increase its support of energy research and development activities", and (5) the key role that energy must play in restoring environmental quality should be made clear to the public. Dr. Seaborg is convinced that "we will witness a transition to the

massive use of nuclear energy in a new economic and technological framework".

2105. **"Judging the Energy Crises"**, *Science News*, v. 98, no. 20, 14 November 1970, pp. 379-380. Differing points of view on the extent, causes, and cures of the energy crises are presented. Factors influencing the fuel shortage are noted and include long-term export commitments by coal companies, mine safety laws, wildcat strikes, and strip mine reclamation laws. Some industry spokesmen say that shortages are due to "escalating costs, environmentalist pressures, and inefficient regulation". While many argue that fuel shortages are due more to artificial economic pressures than to actual deficits, the author points out that physical limitations on both fuel and generating plant capacity are real possibilities for the not-too-distant future.

2106. **Gilluly, R. H., "The Earth's Heat: A New Power Source"**, *Science News*, v. 98, no. 22, 28 November 1970, pp. 415-416. Development of geothermal reservoirs as a source of electrical energy is being investigated seriously, in view of the exhaustibility of fossil fuels and the success of environmentalists in blocking the construction of new generating plants. Studies of California's Imperial Valley indicate a potential of 20,000 to 30,000 Mw of generating capacity. The U.S. Tax Court has made the possibilities attractive by declaring geothermal resources eligible for a percentage depletion allowance similar to that given oil companies. "Holding up major development in the United States right now is lack of a clear-cut policy for leasing of geothermal resources of Federal lands – where most of these resources are found in the 11 Western states. But a bill establishing leasing policies is now in conference committee and is expected to pass this session."

AVIATION

2107. **"Experimental Civilian Aircraft"**, *Science News*, v. 98, no. 22, 28 November 1970, p. 413. National Aeronautics and Space Administration (NASA) will expand its efforts into the area of civil experimental aircraft research. "It will design, research and test experimental aircraft representing civil needs and turn the results over to industry." Expansion of two offices within NASA's Office of Advanced Research and Technology will facilitate the undertaking of this job. The space agency will coordinate efforts with the Department of Transportation. NASA is also "preparing a program for an experimental transport using advanced aerodynamic concepts".

MISCEL. ANEOUS DOMESTIC PROBLEMS

2108. Carter, L. J., "Land Use: Congress Taking Up Conflict over Power Plants", *Science*, v. 170, no. 3959, pp. 718-719. The U.S. does not have a "coherent land-use policy", a fact coming to light under pressure of environmental pollution and related problems of siting new power-generation facilities. The Administration will utilize recommendations from the report "Electric Power and the Environment" (U.S. GPO, 75 cents), sponsored by the White House Office of Science and Technology, to draft legislation for submission to Congress in 1971. The proposed law will regulate the planning, siting, and certification of power plants, and call for an expanded R&D program to improve pollution control, underground transmission techniques, and such. Sen. Muskie has proposed a bill on power plant siting that would require Federal licensing for new bulk power facilities, rather than state or regional authorization. Another bill by Sen. Jackson "would establish a national land-use policy under which the siting of power facilities would be considered along with other activities of significant environmental impact". The article notes that the utility industry's failure to bare its expansion plans openly to the public is causing mistrust and strengthening the case for "comprehensive land-use planning and controls by public agencies".

2109. "Highway Officials Fear Loss of Influence", *Engineering News Record*, v. 185, no. 21, 19 November 1970, pp. 19-20. Biggest fear expressed at the meeting of the American Association of State Highway Officials (AASHO) was continuing loss of influence and fear of being "buried in DOT's intermodal drive". Federal Highway Administrator Francis Turner feels that "roadbuilding will continue to get the lion's share of construction", but his recognition of the importance of intermodal transportation concepts is apparent in some of his recommendations for a national policy: (1) increase the use of passenger trains to reduce "auto volume and airport congestion", (2) "encourage greater co-location of jobs and residences... to cut commuting", (3) "stagger work hours and days", (4) encourage car pools by controlling city parking, (5) consolidate railway tracks and bus terminals to provide interchangeable rights-of-way, and (6) promote "piggy-backing" of heavy trucks on trains to reduce heavy loads on highways.

2110. "Additional Funds Spur Metroliner", *Aviation Week & Space Technology*, v. 93, no. 22, 30 November 1970, p. 34. Department of Transportation's High Speed Ground Transportation Program has been extended, giving continued support to the two experimental demonstration trains, the Metroliner (New York – Washington) and the TurboTrain (New York – Boston). The Metroliner demonstration began 1 October and will continue for 2 years. The Metroliner

predemonstration-period (January 1969 – September 1970) statistics yielded a load factor of 66 percent and an on-time performance of 95 percent. The new contract specifies a Federal commitment of $10,700,151. The TurboTrain completed a 2-year period of DOT funding, and Sikorsky Aircraft is now operating it under a monthly interim agreement. These two demonstrations "have shown that it is possible to divert large amounts of intracorridor air traffic to rail service if reliable service is provided".

3000 NEEDS AND ALLOCATIONS OF RESOURCES FOR SCIENCE

TECHNICAL MANPOWER

3057. *Scientific and Technical Personnel in the Federal Government 1968*, Surveys of Science Resources Series, National Science Foundation, NSF 70-24, May 1970, 31 pp. This report, seventh in a series, "examines the level of [scientific and technical] employment as of October 1968 as well as other changes in occupational trends over the period 1958 through 1968". Significant facts brought out include (1) Federal employment of professional scientific and technical personnel increased only 1 percent in 1968 over the previous year, (2) the Department of Defense employed the largest number at any agency (79,800), 93 percent of whom were scientists or engineers, (3) "about 29 percent of all Federal scientists were engaged in research and development", (4) mean annual salary was $13,700 for scientists and $15,000 for engineers, and (5) "Federal 'nonprofessional' scientific and technical personnel numbered about 123,000 in 1968 and 1967. Over three-fifths were engineering and allied mechanics technicians." (For sale by the U.S. Government Printing Office, Washington, D.C., 20402. Price: 45 cents.)

3058. *Manpower Research Projects Sponsored by the U.S. Department of Labor, Manpower Administration, Through June 30, 1970*, 1970, 341 pp. This report describes all projects in progress at the end of FY 1970, presents summaries of research completed during the year, and catalogs all reports issued since the inception of the research program in FY 1963. A final section of the text is devoted to guidelines for the submission of research proposals on programs to develop and make better use of human resources. In the Introduction, it is pointed out that 12 universities were awarded grants in 1970 totalling $3.15 million over the next 4 years for manpower research and for educating manpower specialists. Also, the Office of Manpower Research, which administers the above programs, has merged with the Office of Special Manpower Programs into the Office of Research and Development, and is now responsible for the Manpower Administration's experimental and demonstration programs as well. Indexes are provided for (1) Contractor and Grantee Organizations and Institutions, (2) Individuals Associated with Contracts or Grants, (3) Contract and Grant Numbers, and (4) Research Subjects. (Single copies of this report may be obtained from U.S. Department of Labor, Manpower Administration, Washington, D.C., 20210.)

3059. Lee, R. D., Jr., Crawford, C., and Rabena, K., "A Profile of State APT Manpower Resources: Preliminary Findings", *Public*

Administration Review, v. XXX, no. 6, November/December 1970, pp. 602-610. "On January 1, 1968, the Commonwealth of Pennsylvania commenced work on the establishment of the Management Planning and Development System, supported by an inventory of the highest-ranking administrative, professional, and technical [APT] personnel in the state. This was and is the only such inventory at the state level. This article provides a profile of APT personnel, based upon a sample of 400 in the inventory of 5,900. Major findings include: (1) Pennsylvania has an aging APT cadre of which a large proportion have served many years in state government; (2) educational achievement among Pennsylvania personnel has been high, and the proportion having some graduate school experience continues to increase; (3) APT recruitment has been restricted mainly to Pennsylvania and adjacent states; (4) personnel born in less-populated counties tend to be over-represented; and (5) persons in the inventory are favorably disposed toward changing their jobs and their geographic locations."

3060. "'Surplus' Scientists Need Training", *Chemical & Engineering News*, v. 48, no. 50, 30 November 1970, p. 7. Walter R. Brode, American Chemical Society President, called on the government for a WPA-type program for unemployed aerospace scientists, and suggested that they could be usefully employed in areas of environmental control, pollution eradication, education, and basic research. Secretary of the Treasury Murray Weidenbaum objected, based on "poor results which have accompanied the [aerospace] industry's previous attempts at commercial diversification, and its well-publicized difficulties with military contracts". He further suggested that contracts on public-sector problems should be awarded only on a competitive basis. Presidential Science Adviser Edward David "said that the real strength of the aerospace industry is its ability to apply a systems approach and technology to large, well-defined problems", but that ecological problems are not defined precisely enough. He therefore recommended the use of inexpensive problem-definition contracts prior to awarding large contracts.

3061. Alden, J. D., "Graduate Engineers – Who Needs Them?", *Technology Review*, v. 72, no. 9, July/August 1970, pp. 33-35. The Director of Manpower Activities of the Engineers Joint Council reviews the scanty employment statistics for advanced-degree engineers over the past few years, cites a number of surveys covering demand for engineers and hiring practices, and makes a "subjective interpretation" of these in terms of the near-future (to 1975) employment prospects for Ph.D. engineers. Some items brought out are that (1) fewer than 25,000 of the 1.1 million-plus engineers in the U.S. are Ph.D.'s; (2) a great majority of the Ph.D. engineers are engaged in research or teaching – mostly in private industry (46

percent) and universities (45 percent); and (3) though studies show that we are faced with a long-term overall shortage of engineers, "the present and future demand for Ph.D. engineers is tied directly to the fortunes of education and research" rather than to the general market. The author states that between now and 1975 the demand for Ph.D. engineers is not expected to increase as fast as the supply. Industry, he says, "may be able to absorb the excess ... if the product is able to meet its requirements". To rectify the imbalances in prospect, "significant changes in existing utilization patterns and possibly changes in national policies will be required".

3062. **"Unemployed Engineers"**, *Engineering News Record*, v. 185, no. 24, 10 December 1970, p. 46. A national registry of unemployed professional engineers has been established by the National Society of Professional Engineers (NSPE) in coordination with the U. S. Department of Labor, the California Society of Professional Engineers (SCPE), and the California Department of Human Resources (CDHR). The program became effective 1 November and was given a Labor Department grant for FY 1971 of $125,000. The registry has not made its trial run yet, and it is estimated that it will take about 1 year to get the program going. The article details the process of registry and computer-matching of prospective employees and employers.

3063. **"Plan to Utilize West Coast Aerospace Unemployed Proposed"**, *Aviation Week & Space Technology*, v. 93, no. 22, 30 November 1970, p. 61. A plan to use the technical and managerial skills of unemployed aerospace professionals has been proposed by a San Francisco financial consultant and a Mountain View economist. "The proposal recommends the formation of regional investment promotion corporations to encourage establishment of new businesses based on promising ideas conceived by the unemployed professionals. The corporations would be established with matching government and private funds, from which they would provide the seed capital needed to launch the new businesses." Long-term, low-cost loans would be provided by the government, and founders of a new enterprise would have to accept lower-than-normal salaries until the undertaking had progressed to the point where conventional venture capital replaced the promotion corporation's interest. Furthermore only proposals for production of new goods and services would be supported.

3064. **"Military Misuses Engineers"**, *Machine Design*, v. 42, no. 30, 10 December 1970, p. 8. The Engineering Manpower Commission (EMC) of the Engineers Joint Council cites statistics which show that the military services are not utilizing the abilities of drafted college-graduate engineers, and recommends immediate action by the military to make better use of talents. The Commission also suggests (1)

expanding the Army Scientific and Engineering Aide program, (2) providing "more commissioned-officer openings where engineers could use their skills", and (3) considering "using college-graduate draftees in all services, not just the Army, to provide a better balance between the needs of each service for technically trained manpower and the skills available in the national manpower pool".

PROGRAMS AND BUDGETS

3065. Schultze, C. L., Hamilton, F. K., and Schick, A., *Setting National Priorities, The 1971 Budget*, The Brookings Institution, Washington, D. C. 20036, 1970, 192 pp. ($6.50, or paper, $2.95). In this book, the former director of the U.S. Bureau of the Budget (1965-1968) and two of his colleagues "(1) identify the major choices in fiscal policy and in specific expenditure programs; (2) consider some of the available alternatives and the reasoning behind the choices actually proposed; (3) discuss . . . several federal programs that continue to be supported despite attempts by several administrations to alter or eliminate them; and (4) project to fiscal 1975 the revenue yield of existing tax laws and the expenditure consequences of current and proposed programs in order to estimate the likely size of the 'fiscal dividend' over the next four years". The book begins with an overview of how the 1971 budget was constructed, and ends with projected revenues and expenditures through 1975 based on stated economic assumptions and alternatives. The four intermediate chapters deal with budgetary aspects of defense; health, education, and income maintenance; other programs (housing, manpower, transportation, pollution, crime, farm supports, space, and R&D); and problems with older programs.

3066. Fisher, W. H., "Probable Levels of R&D Expenditures in 1971, Forecast and Analysis", Battelle Memorial Institute, Columbus Laboratories, December 1970, 8 pp. This forecast of research and development expenditures for calendar year 1971 shows a $1 billion rise over the 1970 figure of $27.5 billion. The increase is expected to come entirely from industry, academic institutions, and not-for-profit organizations. Federal R&D support is expected to decline about 1.2 percent. A breakdown shows anticipated CY 1971 R&D expenditures by the Federal Government to be $149 billion; by industry, $12 billion; by academic institutions, $1 billion (plus); and by not-for-profit organizations, about $432 million. While Federal funds are expected to remain the largest single source of revenue, industry will actually perform about 70 percent of the research. The increase in industrial funding of R&D (from 31 percent in 1964 to 40 percent in 1970) reflects the growing importance attached to R&D for long-term benefits by industrial management. In addition, the new "try-before-you-buy" attitude of Congress is forcing firms to finance their own

prototype development on products intended for Government use. (Copies of this report may be obtained from Publications Office, Battelle Memorial Institute, Columbus Laboratories, Columbus, Ohio 43201.)

3067. **"Federal Funds for R&D Continue to Remain Level"**, *Science Resources Studies Highlights*, **NSF 70-28, National Science Foundation, 14 August 1970, 4 pp.** Dollar figures and distributions of known and estimated Federal obligations for R&D through FY 1971 are summarized according to character of work (basic research, applied research, development); agency (DOD, NASA, AEC, HEW, and 28 others); type of performer (Federal intramural, industrial, university, other nonprofits); and field of science (life sciences, physical sciences, engineering, environmental sciences, and others). Overall trends indicate that (1) support for basic research will continue to increase by approximately 3 percent annually, while applied research funding, which has been virtually level since 1967, is expected to increase about 13 percent between 1970 and 1971; (2) major support agencies – DOD, NASA, and AEC – accounted for 82 percent of the total Federal R&D budget in 1970, compared with 91 percent in 1960; (3) 77 percent of the Federal R&D obligations in 1970 will be directed to non-Federal performers; and (4) "engineering and life sciences were scheduled to receive the most research funds in 1970". (This report may be obtained from Government Studies Group, Office of Economic and Manpower Studies, National Science Foundation, Washington, D.C. 20550.)

3068. **Black, G., "The Effect of Government Funding on Commercial R and D", pp. 202-218 of** *Factors in the Transfer of Technology*, **edited by Gruber, W. H., and Marquis, D. G., M.I.T. Press, Cambridge, Mass., 1969.** Funding, technologies, and management practices in 67 laboratories related to three industries – nonelectric machinery, electrical machinery, and instruments – were studied to determine the interaction of Federal and private R and D. "The results . . . indicate that performance of government contract R and D by industry has accelerated change in management practices and has influenced the technology used in industry laboratories, including that used for private work." While some changes were "accommodation" to government practices, many changes were voluntary as a result of experience with Federal contracts. (This paper is available as Reprint No. 9, July 1970, from Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. 20006.)

3069. **"ARPA Cuts Support"**, *Chemical & Engineering News*, **v. 48, no. 47, 9 November 1970, p. 16.** The interdisciplinary materials laboratories (IDL) at 12 universities, created in 1960 to do basic research

and provide graduate training in materials science, will lose the support of the Advanced Research Projects Agency (ARPA) some time in FY 1972. Arrangements have been made for NSF to take over most of ARPA's share of IDL funding, with an appropriate increase in NSF's budget. Currently, ARPA is providing about 35% of IDL's annual budget; 17% "comes from other Pentagon sources, 26% from other government sources, and 22% from industry and university sources". A tight FY 1972 Federal budget poses a hazard to the new arrangement. Also, it will have to "survive eight Congressional committees and Congress itself".

3070. "Plowshare Ploughed Again", *Nature*, v. 228, no. 5272, 14 November 1970, p. 604. The Plowshare project for the development of peaceful uses of nuclear explosives is expected to lose funds with the President's request to terminate the Panama Canal excavation aspect of the program. For FY 1971, Plowshare funding was reduced from FY 1970's $14.5 million to $7.5 million, most of which is being used for "underground engineering aspects". It now appears that the FY 1972 budget will likewise provide no funding for nuclear excavations, but funds will be used for studies of underground explosions (like the gasbuggy series) that minimize the release of radioactivity to the environment.

4000 NATIONAL R&D PROGRAMS

SPACE

4069. Singer, F. S., "Exploring Space in the Seventies", *Bulletin of the Atomic Scientists,* v. XXVI, no. 9, November 1970, pp. 22-23. The author deals with three basic questions about space exploration: (1) "Is science the only goal of space exploration" or should it be?, (2) "What is the role of man in space exploration?", and (3) "How are we doing on priorities in our scientific goals?" The first question is given a negative answer on both counts, and national prestige is seen as a "realistic" goal. Science alone would not justify expenditures of $4 billion per year. Science is viewed as a major goal, but not the only one. In regard to the second question, Singer states that man in space "does contribute to the scientific content of the program", and is an "economical alternative to redundancy, to self-repairing circuits, to self-adjusting instrumentation features". In fact, says Singer "if we try to do away with or downgrade the manned part of the space program, we may find that we don't have any space program at all". Finally, with regard to priorities, the author feels that detailed selenological explorations cannot be justified, and that space-exploration money would be better spent on more fundamental space problems that enhance our understanding of the development of earth and of global processes. He describes several possible space programs with high potential rewards along these lines.

4070. Morgenthaler, G. W., and Morra, R. (Eds.), *Planning Challenges of the 70's in Space,* Proceedings of American Astronautical Society (15th Annual) and Operations Research Society (35th Annual) for sessions on space only June 17-20, 1969, Denver, Colorado, Advances in the Astronautical Sciences, v. 26, AAS Publications Office, P.O. Box 746, Tarzana, Calif. 91356, 1970, 445 pp. ($16.75). This book contains the full texts of 30 papers and abstracts of 16 additional papers on the theme of aerospace missions for the 70's and their potentials for applications to earth problems, which is one of three major themes covered at the Denver meeting. The Introduction consists of astronaut W. M. Shirra's keynote address and Air Force Secretary R. C. Seamans' talk on defense capability in the 70's. Papers by two high-ranking Soviet scientists are included – one on Venus experiments and the other (abstract only) on game approach to space vehicle descent. Among the topics covered (with up to 5 papers under each) in the book are future manned and earth orbital science missions; earth orbital resource missions; large space stations, space logistics, and rescue; space ecological technology and human factors; future lunar missions; beyond the solar system; space applications; commercial utilization of space; and space-flight safety.

4071. "Is Space Worthwhile", *Nature*, v. 228, no. 5271, 7 November 1970, pp. 498-499. At a NASA mission-planning conference in New York, Dr. Norman Baker of Columbia University protested that NASA cared little about astronomy and suggested that the space agency divert a few percent of its budget to ground-based optical and radio telescopes. Dr. Wernher von Braun emphasized the desirability of a space shuttle for "maximizing the return for space applications and science". Von Braun agreed that current budget constraints make it impractical to develop the shuttle and space station simultaneously and that it would be best to develop the shuttle first. The article suggests that development of electric propulsion "would open up the solar system to a new generation of probes that could be launched by the Titan class of rockets". The Orbiting Astronomical Observatory (OAO) series of satellites is discussed briefly.

4072. "Venus Exploration and the Value of Small Missions", *News Report*, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 9, November 1970, pp. 2-3. A panel of the Space Science Board of the NAS, in reviewing the Board's 1968 Planetary-Exploration study, reaffirmed the earlier recommendations that Venus and Mars be studied by a small Pioneer/IMP-class spinning spacecraft. The panel further noted that NASA's current program "contains no significant Venus missions". Aim of the study would be to determine why Earth's near-twin in size, mass, and location in the solar system has evolved so differently. The Panel also recommended that NASA "continue to support and develop earth-based studies of Venus". The cloud systems of Venus and the planet's high surface temperatures have aroused the interest of those concerned with possible environmental changes on earth because, according to the panel, "Venus is an observable example of a class of problem that concerns our own environment". A Planetary Explorer spacecraft costing considerably less than M. iner is recommended. A series of missions, each built on observations of the previous ones, is envisaged, using "probes, landers, and orbiters in combination, each supporting the other... In times of fiscal stringency, [mission: can] be reduced in frequency without a complete cutoff of the program." Specific missions are recommended by the panel for 1975 through 1980.

4073. Johnsen, K., "Space Science Projects Funding Sought", *Aviation Week & Space Technology*, v. 93, no. 19, 9 November 1970, pp. 20-21. NASA's Office of Space Science Applications (OSSA) is hoping for approval of a $1.78 billion budget after 30 June 1970 to complete its current programs, as well as approval of funding to start two major unmanned projects in FY 1972. The two programs are the High-Energy Astronomy Observatory (HEAO) and the Grand Tour flybys of the five outer planets. Two missions appear likely in the

Grand Tour flyby: Jupiter-Uranus-Neptune in 1978, 1979, or 1980; and Jupiter-Saturn-Pluto in 1977 or 1978. Extremely favorable launch windows appear in the years noted above which take advantage of favorable planetary alignments that will not reappear until the year 2155 in the first instance and 2076 in the second. FY 1972 funding needs are estimated at $10 million for HEAO and about $30 million to $50 million for the Grand Tour.

4074. **"NASA Studies Planetary Habitation Methods"**, *Aviation Week & Space Technology*, **v. 93, no. 22, 30 November 1970, pp. 62-63.** A long-range look at the possibilities of man's inhabiting other planets and introducing the life forms necessary to make them habitable was the subject of a "Planetary Habilitability Meeting" at NASA's Ames Research Center. The advisability of introducing terrestrial organisms to other planets was questioned because of the possibilities of uncontrolled mutation. Recent advances in genetics, cell reassembly, and cell fusion have prompted speculation about the potential of assembling new forms of organisms on other planets. NASA stressed that these speculations do not mean that the agency is abandoning its policy of avoiding contamination of the planets with terrestrial organisms. Planets being considered included Mars, Venus, and Jupiter. Stanford's Lederberg pointed out that Jupiter contains "more organic material than all the rest of the solar system put together", and is thus "a very exciting prospect for exploration".

4075. **"What Experiments Should be Carried on Outer-Planet Flybys?"**, *Machine Design*, **v. 42, no. 30, 10 December 1970, p. 30.** While NASA's Grand Tour flyby missions have not yet been authorized, scientists are being invited to participate in the definition phase of the project. The outer planet alignment later in this decade will not recur for 179 years, and NASA hopes to take advantage of the alignment and gravitational fields of the planets to boost a spacecraft successively from one planet to the next. Information would be sought from the various planets on physical properties, atmospheric composition, geological features, thermal regimes, energy balances, charged particles and electromagnetic environments, periods of rotation, and radii. In interplanetary space, studies would be made of solar wind plasmas and magnetic fields, solar energetic particles, galactic cosmic rays, and interplanetary dust. NASA plans to select the scientists to participate in the definition phase by March 15, 1971.

SUPERSONIC TRANSPORT

4076. **"SST Prospects; Funding Continues"**, *Aviation Week & Space Technology*, **v. 93, no. 20, 16 November 1970, p. 15.** Subsequent to the appearance of this news item, compromise recommendations of a

House-Senate conference committee failed to satisfy Senate opponents of the SST, who are filibustering in an attempt to prevent the FY 1971 SST appropriations bill from coming to a vote before the 91st Congress adjourns. "Meanwhile, the program is moving ahead without current financial problems due to interim funding through the continuing resolution process. Government program managers can obligate funds so long as the total does not exceed the $184 million available to the supersonic project in Fiscal 1970 or the obligations in any one month do not exceed the $23.8 million obligated in June, 1970. This amount of expenditure was endorsed in October by the General Accounting Office. Some short-term financial pressure on the Office of Supersonic Transport Development produced by the appropriation delay has been eased by minor slips that have slowed the acceleration of the program... Through November, a total of $110.6 million was expected to have been obligated in Fiscal 1971, with $18.5 million programed for December. If Congress kills the project, it would still be required to appropriate funds to cover the Fiscal 1971 obligations – less the $23.5-million prior-year carryover – plus at least $80 million in termination costs."

4077. **"Concorde Boss Advises Build America's SST", *Machine Design*, v. 42, no. 30, 10 December 1970, p. 10.** Sir George Edwards, chairman and managing editor of British Aircraft Corp., has advised the U.S. to build the supersonic transport, noting that the importing into the U.S. of 100 $20-million Concordes "is certainly going to propound cash and balance of payments problems" for the U.S. Sir George detailed progress on the BAC/Aerospatiale Concorde and reaffirmed performance claims for the 1,400-mph, Mach-2 airplane.

ANTARCTIC RESEARCH

4078. ***Report on United States Antarctic Research Activities, 1969-70; United States Antarctic Research Activities Planned for 1970-71*, Committee on Polar Research, Report No. 12 to SCAR, National Academy of Sciences, National Research Council, July 1970, 85 pp.** Information on the U.S. Antarctic Research Program from October 1969 through September 1970, as well as planned activities for the period October 1970 through September 1971, is contained in this report. Most of the data are presented in tabular form and include the locations and manpower complements of the eight U.S. stations; descriptive information on their atmospheric, earth-sciences, and biological studies; a résumé of their research-vessel operations; a description of their information activities; and a bibliography of almost 400 selected publications on U.S. Antarctic research. (This report may be obtained from the Committee on Polar Research, National Academy of Sciences, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

TRANSPORTATION

4079. Schatz, G. S., "Chaos in Transportation: Which Way is the Exit?", *News Report*, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 9, November 1970, pp. 1, 6-7. The National Academy of Sciences will conduct a major study of transportation planning and coordination in the United States at the request of the President's Advisory Council on Management Improvement to "rationalize" the country's transport patterns. Transport patterns have been largely determined by state and local decisions and private funding. Basic position of the study is "that sound transport planning must continuously involve all participants – governments, users, carriers, and suppliers – who make transportation decisions, and that despite improved planning in recent years the planning process remains fragmented, limited in outlook, and insufficiently coordinated". NAS will include the following in its study: (1) "evaluation of national transportation planning", (2) "definition of problems facing the Federal Government", (3) "alternative planning approaches and institutional arrangements", and (4) "implementation strategies". The study will help to "bring advanced forecasting and planning methods into practice in Federal transportation decisions".

5000 SCIENCE, EDUCATION AND THE UNIVERSITY

5040. Killian, J. R., Jr., "University Research and National Priorities", *Technology Review,* **v. 72, no. 9, July/August 1970, pp. 23-25.** The contributions of university research to U.S. scientific strength are detailed. While the author notes that industrial laboratories are heavily engaged in applied research, he points out that "the major responsibility for basic research has rested with the universities". Arguments for strengthening, rather than curtailing, university research are presented. For example, the free environment found in university laboratories is considered more conducive to successful creative research than is the "authoritarian" air of industrial laboratories. Also, universities stimulate interaction among many different disciplines and provide avenues for the physical and social sciences, engineering, and management to join forces toward common objectives. Current skepticism about "benign uses of science and technology" is brought out, along with the necessity of mastering "the problems of control and use, of technology assessment, and of foresight". In the words of MIT's F. Weisskopf, "The numerous problems created by the rapidly expanding application of science can be solved only by painstaking investigations . . . [using] more basic science and not less of it". Killian points out that this is a job for university research, and that it would be dangerous to the nation to permit its university resources to be eroded through lack of financial support.

5041. "Federal Support to Universities and Colleges, Fiscal Year 1969", *Science Resources Studies Highlights,* **NSF 70-26, National Science Foundation, 11 August 1970, 4 pp.** An analysis of Federal appropriations to universities and colleges for FY 1969 is presented. The data show that universities and colleges got only 1.87 percent of the total FY 1969 Federal budget, as compared with 2.24 percent in FY 1966. With an adjustment for inflation, this drop amounted to 2 percent a year between FY 1967 and 1969. In FY 1969, two-thirds of the Federal funds obligated to universities came from the Department of Health, Education, and Welfare. Of this amount ($2.3 billion), 55 percent went for R&D and other science-related programs. The National Science Foundation provided the second largest amount for institutions of higher education – $367 million, or 13 percent less than their 1968 figure. NASA and the Departments of Commerce and Interior also showed declines in their FY 1969 support of universities and colleges. Dollar breakdowns are tabulated by year, function (R&D, plant, other science, nonscience), agency, and geographic location. In addition, there is a list of the 100 universities and colleges that received the largest Federal grants in FY 1969 (totalling $2.39 million), showing the amount received by each. (Copies of NSF 70-26 are available from the Editorial and Inquiries Unit, Office of

Economic and Manpower Studies, National Science Foundation, Washington, D.C. 20550.)

5042. **"Resources for Scientific Activities at Universities and Colleges, 1969", *Surveys of Science Resources Series*, NSF 70-16, National Science Foundation, May 1970, 152 pp.** A summary of NSF's 1969 survey of scientific activities in universities and colleges is presented. It covers information on 1969 employment of scientific and technological personnel and 1968 financing of scientific and engineering activities. Full and part-time employment of scientists and engineers in the nation's universities and colleges reached 253,500 in 1969, an increase of 8.1 percent over 1967. By specialty, 65 percent were in teaching, 23 percent in R&D, and 12 percent in other activities. A breakdown of the $7 billion spent by universities and colleges for scientific activities in 1968 shows the following figures: current R&D, $2.6 billion, or 37 percent; current instruction, $3.3 billion, or 47 percent; and capital expenditures, $1.1 billion, or 15 percent. Previous growth rate of R&D expenditures (17 percent per year in 1958-66) slowed to 11.7 percent for the period 1966-68. Detailed data are presented on financing of graduate students in science and engineering, technician employment, financing of scientific activities, R&D and capital expenditures, manpower and financial resources, and scientific activities in medical schools. Manpower and financing in federally funded R&D centers administered by universities are discussed in a separate part of the report. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: $1.25.)

5043. **Greenberg, D. S., "Academic Research: OST Aide Sees No Shift in Financial Situation", *Science*, v. 170, no. 3961, 27 November 1970, pp. 952-954.** An analysis and interpretation is presented of a "discouraging" financial forecast of federal support for academic research by OST's technical assistant for basic science, Carl York. York's forecast is based on the apparent "OST decision to regard 6 percent in federal funds as an acceptable annual growth rate – 5 percent of which would be to compensate for inflation. (A 15 percent annual growth rate is the figure specified in recent years by many research administrators as the minimum necessary for maintaining present efforts and accommodating newcomers to the ranks of research.)" York attributes the decision on 1 percent growth to retired Presidential science adviser Lee DuBridge, contending "that it may be possible to stabilize the overall funding for higher education in this country, but it is not going to be possible to do very much about stabilizing the expenditures in any given field of science". It was not made clear whether DuBridge's successor, Edward David, accepts the 6 percent guideline. York also noted that the FY 1972 budget level "should be maintained at a constant value [same as FY 1971] until a better understanding and more sophisticated analysis of

the country's manpower needs can be made". Greenberg observes that "science policy ruminating has developed into an academic cottage industry" and complains that "the actual makings of science policy or practice appears to be in the vicinity of nonexistence".

5044. "Student Influence", *Chemical & Engineering News*, v. 48, no. 47, 9 November 1970, p. 14. Dr. James C. Kellett, director of NSF's College Science Improvement Programs (COSIP), discussed new NSF directions at a science and liberal arts conference at Williams College. The new directions include "multidisciplinary research on the undergraduate level and increased responsibility for students in directing their own educational programs". COSIP grants (mostly for 3 years), held by 130 schools, averaged $209,000 each in FY 1970. Multidisciplinary approaches, not required with COSIP funds, "are required in the $1 million Student-Originated Studies (SOS) program that begins next year". Emphasis will also be placed "on the independent study component of the Undergraduate Research Participation and independent study program (URP)... Self-paced instruction programs are also due for greater support."

5045. "Colleges Revamp Science Teacher Training", *Chemical & Engineering News*, v. 48, no. 48, 16 November 1970, pp. 40-41. Activities in overhauling the instruction of students who intend to teach scientific subjects from the elementary-school level up are described. The National Science Foundation's Undergraduate Pre-Service Teacher Education Program (UPSTEP) is funded in 14 universities at an aggregate level of $1 million for FY 1970. Its appropriations will be increased to $2 million in FY 1971 if Congress approves. The science and education departments in a college must work together under UPSTEP programs, which are intended to be exploratory. Introduction of new courses is encouraged, as is stepping up of the amount of student teaching required. A similar program, sponsored by the Alfred P. Sloan Foundation, is discussed. In 1967, Sloan gave a number of liberal arts colleges 5-year grants of $250,000 to $500,000 each "to strengthen their programs in science teaching and research". Sloan funds have been used to bring high-school science teachers to the campus to teach education majors the practical aspects of teaching high school science. At Antioch, Sloan money established a science learning center for both formal courses and independent study directed toward elementary and secondary-level science teaching.

5046. *Environmental Quality Education Act of 1970*. Hearings before the Select Subcommittee on Education of the Committee on Education and Labor, House of Representatives, 91st Congress, March, April, and May 1970, 855 pp. Testimony and prepared statements of literally dozens of witnesses regarding H.R. 14753 are presented. The

bill calls for funds for (1) "aid to colleges and universities to develop materials for teaching environmental studies, natural resources, pollution control, and conservation"; (2) "training teachers of environmental studies"; (3) teaching of ecology courses in elementary and secondary schools and universities; (4) "community conferences on the environment for civic and industrial leaders and state and local government officials"; and (5) "preparing materials on the environment for use by mass media". A 21-member representative Advisory Committee on Environmental Education is to be appointed by the Secretary of HEW to advise the Secretary on the formulation of regulations, allocation of funds, selection and administration of funded activities, and evaluation of projects and programs. (This report may be obtained from the Committee on Education and Labor, U.S. House of Representatives, Washington, D.C.)

6000 SCIENCE, MANAGEMENT AND POLICY-MAKING BODIES

TECHNOLOGY ASSESSMENT

6077. Mayo, L. H., *Scientific Method, Adversarial System, and Technology Assessment*, Monograph No. 5, Program of Policy Studies in Science and Technology, George Washington University, Washington, D.C., November 1970, 109 pp. The concepts of scientific method and the adversarial system as related to technology assessment are defined and compared. The adversarial system, or advocacy, "is directed toward gaining recognition for certain types of effects of a technological application and toward persuading the assessment entity to apply evaluative criteria to such effects". It is noted that scientific method is limited in its applicability to value judgments or selecting social goals, and thus has little to offer in the "social impact-evaluation phase of the technology assessment process". The scientific method does provide data, "but as a method of inquiry it clearly does not satisfy the data requirements for technology assessment . . . [and] has relatively little direct contribution to goal clarification". Technology assessment is defined as a process of evaluation, and scientific method and advocacy have appropriate but subordinate roles to play in assessment. The adversarial system is encouraged because it lends itself to "comprehensiveness and openness of assessment information". (Available as Report No. GWPS-M 5 from National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)

6078. Jones, E. M., *Advocacy in Technology Assessment*, Staff Discussion Paper 209, Program of Policy Studies in Science and Technology, George Washington University, Washington, D.C., November 1970, 76 pp. This is an informal staff paper intended to "explore the contribution of advocacy to the technological assessment function [TAF] of legal process, particularly of Congress". Technology assessment is defined as "a process of inquiry directed toward identifying the effects (past, present, and future) of the application of a particular technology, evaluating the effects thus identified, developing alternatives for changing effects, and appraising the benefits and costs of each alternative". Advocacy is seen as "a strategy for influencing decisional outcomes of legal process", and is "intended primarily to assist in the intelligence function of decisional systems". The paper also discusses elements involved in determining the criteria of assessment and potential contributions of advocacy, as well as the context and conditions of TAF and advocacy. "The general conclusion is that criteria of adequate assessment cannot be met without a prominent role for advocacy." (Available as Report No. GWPS-SDP 209 from National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)

6079. "Technology Assessment: What's New?", *Astronautics and Aeronautics,* v. 8, no. 11, November 1970, pp. 11-12. Comments and observations of Gabor Strasser of the President's Office of Science and Technology on the problems of technology assessment are presented. Strasser notes the variety of definitions and adds his own: "technology assessment is nothing more than a systematic planning and forecasting process, that delineates options and costs, encompassing economic as well as environmental and social considerations, that are both external and internal, with special focus on technology related 'bad' as well as 'good' effects". One of many problems is that evaluation of a program is required as a "prospective" rather than as a "retrospective" process. OST has issued a $100,000 contract to MITRE Corporation for pilot assessment studies in five problem areas: (1) impact of computers on society, (2) ocean farming, (3) automobile emission standards, (4) pollution abatement, and (5) introduction of industrial enzymes. It is hoped that a better definition of technology assessment will emerge from the studies, along with more understanding of the limits of the process and a demonstration of how to extend the process. It was noted that we must not allow technology assessment to "discourage innovation or stifle progress" but we should use it to "provide a better way to balance risks against benefits in a broad context".

6080. "Congress Looks for Equal Billing on National Issues", *Astronautics & Aeronautics,* v. 8, no. 11, November 1970, pp. 13-14, 16. Three pending measures would give Congress more policy-making power on national issues. The first is a bill that would provide for an Office of Technology Assessment (Daddarios' proposal) to assist Congress "in determining the relative priorities of programs before it". The second bill, the "Full Opportunities and National Goals and Priorities Act", would establish a Council of Social Advisers to the President, which would prepare a report giving the President a broad look at a wide range of social conditions. The bill would also establish an Office of Goals and Priorities Analysis in Congress. The third bill would rename the General Accounting Office the "Office of the Comptroller General of the United States". The Office would analyze and review legislative proposals, as well as review long-term costs and benefits, current and prior estimated costs, options available, changes in performance specifications, and slippage in time schedules. Any one or all three of the measures would provide Congress with "its own advisers and the basis for asserting a broader policy-making role".

MANAGEMENT

6081. "From the Daddario Subcommittee, Suggestions for the Academies", *News Report,* National Academy of Sciences, National

Research Council, National Academy of Engineering, v. XX, no. 9, November 1970, pp. 10-11. Among its recommendations toward a U.S. science policy (see Abstract 1059), The House Subcommittee on Science, Research, and Development suggested that the National Academy of Sciences, and The National Academy of Engineering "function as liaison between the national Government and the public". The Academies' chartered purpose is to provide the Government with a competent source of technical advice. The Subcommittee recommended that the Academies petition the Government, if necessary, to revise their charters to include a similar function for the general public, and that Federal funding should be provided to the Academies through the OST for this purpose.

6082. "Reorganization Plans", *Science News*, v. 98, no. 20, 14 November 1970, p. 389. Reorganization studies under way at NASA will affect three major offices – Advanced Research and Technology (OART), Space Science and Applications (OSSA), and Manned Space Flight (OMSF). OMSF may shift its emphasis to multiple, rather than single, projects. Biology programs, currently overlapping, may be organized under one office that would include space biology, biomedicine, and biotechnology. Changes already made in OART (see Abstract 6083) have resulted in greater emphasis on aeronautical and spacecraft research. It is expected that some departments will be eliminated.

6083. Winston, D. C., "Aeronautics Research Growth Expected", *Aviation Week & Space Technology*, v. 93, no. 19, 9 November 1970, p. 22. The reorganization in NASA's Office of Advanced Research and Technology, in response to greater interest in aviation problems and the declines in funding of space programs, is expected to permit NASA to concentrate more on basic research. New divisions created by the reorganizations include the following: (1) Aeronautical Research, (2) Aeronautical Propulsion, (3) Aeronautical Operating Systems, (4) Materials and Structure, (5) Guidance, Control and Information Systems, (6) Environmental Systems and Effects, and (7) Space Propulsion and Power. According to NASA officials, these divisions will launch "specific engineering development programs, which would then be organized into separate offices . . . [and] would coordinate with work performed in the research centers operated by NASA".

6084. "Radiation Authority in Question", *BioScience*, v. 20, no. 22, 15 November 1970, p. 1212. A new bill, passed by the House and now before the Senate, "would restrict the authority of the new Environmental Protection Agency [EPA] to set radiation standards". It is feared that this may "give standard-setting authority to private scientific groups which have close relationships with the Atomic

Energy Commission". If the bill passes, the EPA will have to contract with the National Council on Radiation Protection and Measurements for broad and continuing review of basic protection standards, and will also have to contract with the National Academy of Sciences for "a continuing review of biological effects of radiation on man and ecology". The bill states that reports from both the NCRP and the NAS shall be published by the EPA, and their recommendations "shall be carefully considered by any government agency having authority to establish such standards".

AGENCIES

6085. *Summary of Activities of the Subcommittee on Science, Research, and Development, 1963-70,* Committee on Science and Astronautics, U.S. House of Representatives, Ninety-First Congress, Second Session, 1970, 83 pp. This summary is presented in topical form, essentially chronologically, and includes a description of each activity, its consequences, and suggestions for future activity where appropriate. Topics include Federal science policy, funding of Federal R&D programs, aeronautics, science education, National Science Foundation, science information systems and handling, standard reference data, environmental quality, fire research, technology assessment, management of Federal scientific activities, international science, and multidisciplinary or systems studies. As an illustration, the first topic, Federal science policy, is covered under eight subject headings, the first being *Identify Problems and Assign Priorities.* Under this topic, "Action" consisted of (1) holding of hearings on Government and science in October and November 1963 (witnesses and dates are listed); (2) publication of a statement of purpose with preliminary findings; (3) creation of a Research Management Advisory Panel (RMAP); (4) publication of a survey on problems of congressional information and advice relative to scientific and technological matters; and (5) publication of a progress report of subcommittee activities. Under "Result", it is pointed out that the above activities led to the establishment of the Science Policy Research Division of the Legislative Reference Service and also helped to identify suitable candidates for the RMAP. The latter meets with the subcommittee every 3 or 4 months to discuss government-science issues and procedures – a most helpful guide to the identification of problems requiring priority attention of the Congress. (Report may be obtained from House of Representatives, Committee on Science and Astronautics, Washington, D.C. 20515.)

6086. *The National Institutes of Research and Advanced Studies – A Recommendation for Centralization of Federal Science Responsibilities,* Report of the Subcommittee on Science, Research, and Development to the Committee on Science and Astronautics, U.S.

House of Representatives, 15 April 1970, 55 pp. Five recommendations by the Subcommittee, based on several years of hearings and deliberations aimed at defining the most effective organization for Federal Science activities, are presented: (1) establishment of an independent agency called National Institutes of Research and Advanced Studies (NIRAS) to consolidate Federal responsibilities for basic research and graduate education; (2) "strengthening of the science superstructure in the Executive Office of the President" by increasing the staff, status, and responsibilities of the Office of Science and Technology (OST); (3) providing for "stable, continuous, predictable funding of academic science and higher education"; (4) fostering mission-agency support of basic research within their own laboratories and in the universities; and (5) consolidating the jurisdictions of Congressional committees dealing with research and education at the graduate level in all fields of learning. The voluminous testimony of a score of prominent scientists at hearings held in July and October of 1969 is analyzed under the headings Adequacy of Present Federal Organization for Science and Technology; Methods of Effecting Changes in the Federal Organization for Science and Technology; The Case for Further Centralization; Strengthening the Present Federal Organization for Science, Technology, and Education; and Legislative Reorganization. (Single copies of this report are available from the House of Representatives, Committee on Science and Astronautics, Washington, D.C. 20515.)

6087. *The National Oceanic and Atmospheric Administration Fact Sheet*, U.S. Department of Commerce, October 1970, 11 pp. This descriptive brochure gives the history, organization, and mission of NOAA, created by President Nixon as an agency of the U.S. Department of Commerce. NOAA's interim organization includes the *National Ocean Survey, National Weather Service, National Marine Fisheries Service, National Environmental Satellite Service, Environmental Research Laboratories, Environmental Data Service, Office of Sea Grant, National Oceanographic Instrumentation Center, Marine Minerals Technology Center* and *Data Buoy Project Office.* These agencies are concerned mainly with existing programs that were assimilated by NOAA – mostly from departments other than Commerce. The functions of each of NOAA's elements and new staff activities are described, and an organization chart is presented to show their interrelationship. (The Fact Sheet and descriptive literature may be obtained from U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Public Information, Rockville, Md. 20852.)

6088. "Reorganization in Ocean Studies: Academies Form New Boards, Joint Cooperation Group", *News Report*, National Academy of Sciences, National Research Council, National Academy of

Engineering, v. XX, no. 9, November 1970, p 1. The National Academy of Sciences Ocean Affairs Board in the National Research Council's Division of Earth Sciences will replace the NAS Committee on Oceanography as the NAS's ocean study and advisory unit. Likewise, the National Academy of Engineering has renamed its Committee on Ocean Engineering the "NAE Marine Board", with similar duties for the NAE. The NAS Board will be concerned principally with ocean science, ocean resources, and international marine-science-affairs policy. It will serve as the U.S. representative group on the Scientific Committee on O eanic Research, of the International Council of Scientific Unions. The NAE Board will employ "standing panels" to cover the functional engineering areas of ocean research. It will be the "U.S. National Committee for the Engineering Committee on Oceanic Resources, now in the process of affiliation with the World Federation of Engineering Organizations".

PERSONALITIES

6089. "Ruckelshaus Heads EPA", *Chemical & Engineering News*, v. 48, no. 48, 16 November 1970, p. 12. The Environmental Protection Agency's (EPA) new head, William D. Ruckelshaus, selected by President Nixon, comes to the post with experience in prosecuting polluters. Ruckelshaus served as assistant attorney general in the Department of Justice and previously as assistant attorney general of Indiana. In 1963 he wrote Indiana's air-pollution-control law. To carry out the Federal antipollution effort, Mr. Ruckelshaus will have 5743 employees in the 15 agencies that are being combined to form EPA. The annual budget is currently about $1.4 billion. While he has as yet not given out a list of priorities, Ruckelshaus "points out that EPA's primary responsibility is enforcement" and that he intends to go after polluters and will press for Federal suits against them. He observes that industrial polluters must "be convinced that we are serious about enforcing these laws".

7000 SCIENCE, FOREIGN AFFAIRS AND NATIONAL DEFENSE

FOREIGN AFFAIRS

7054. "Environment Corps", *Science,* v. 170, no. 3961, 27 November 1970, p. 956. "The Peace Corps and the Smithsonian Institution have announced a joint program whereby teams of volunteers will be sent to developing countries to work on projects relating to conservation, wildlife preservation, resource development, watershed and forestry management, and pollution prevention. Some 200 volunteers, most of whom will come from postgraduate schools in biological sciences and natural resource management, are expected to participate in the program next year. Send applications to the Office of Ecology, Smithsonian Institution, Washington, D.C. 20560."

7055. "Europe Beckons", *Chemical & Engineering News,* v. 48, no. 49, 23 November 1970, p. 13. The relatively small share of Europe's pollution-control-equipment imports that is supplied by U.S. industry is discussed. According to a U.S. Department of Commerce market survey, Germany, France, Belgium, The Netherlands, and Italy plan to increase their multimillion-dollar subsidies for pollution-control equipment by factors of 1.5 to 3 in the next 10 years or so. Commerce has been holding regional briefings to persuade U.S. companies to match their technology against that of European competitors at the pollution-control-equipment trade fair in Switzerland next June.

7056. "The International Biological Program", *News Report,* National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 9, November 1970, p. 11. "Congress has accorded priority to Federal support for U.S. participation in the International Biological Program. In a joint resolution signed by President Nixon on October 7, the Congress declared that the program 'deals with one of the most crucial situations to face this or any other civilization – the immediate or near potential of mankind to damage, possibly beyond repair, the earth's ecological system.' The joint resolution called upon Federal departments and agencies 'to support and cooperate fully' with the IBP and declared that 'provision by the United States of adequate financial and other support' for IBP 'is a matter of first priority.' The measure puts special emphasis on Federal interagency coordination and calls for agencies to cooperate with the U.S. National Committee and the Interagency Coordinating Committee for IBP in project planning. IBP, the resolution declares, 'provides an immediate and effective means' to meet the world's environmental problems, 'through its stated objectives of increased study and research related to biological productivity and human welfare in a changing world environment.' "

7057. Walsh, J., "Taiwan: U.S. Tries One-Man Experiment in 'Postaid' Assistance", *Science,* v. 170, no. 3960, 20 November 1970, pp. 835-839. The background and highly effective activities of American physicist Bruce Billings on Taiwan are described. Billings was appointed in 1968 by President Johnson to provide the Republic of China with a pipeline to American expertise, particularly in science and technology, following the phaseout of formal economic and technical assistance which Chiang Kai-shek had enjoyed since 1949. He was made the ambassador's special assistant for science and technology and also the American commissioner on the prestigious JCRR (Joint Commission on Rural Reconstruction). His "mode of operation is to look and listen until he sees a problem . . . and then to . . . find experts – usually from the United States – who can define ways to solve the problem". Some areas in which he has been deeply involved are (1) computerization of a large segment of the Taiwan government's operations; (2) expanded "use of aerial photography and photogrammetry to facilitate road building and forest-resource evaluation in Taiwan's mountainous terrain", and (3) promotion of "oceanography, which is germane to Taiwan's increasingly important and efficient fishing industry . . . The Billings experiment in Taiwan is accounted a success, and so in a similar set of circumstances we are likely to see an attempt at replicating it."

7058. "Exchange With France", *Science,* v. 170, no. 3960, 20 November 1970, p. 836. "The National Science Foundation (NSF) has announced that six young doctoral scientists will go to France for 5 to 15 months of study and research and four French scientists will come to the United States under a bilateral exchange program inaugurated last July. Each country will provide its scientists with travel money and stipends, but host institutions will receive funds from their respective governments to pay for space, supplies, and equipment. The program came about as a result of visits early this year between President Nixon and French Premier Pompidou. Recent doctoral scientists interested in future participation in the program may address inquiries to NSF's Division of Graduate Education in Science, Washington, D.C. 20550."

7059. "AEC Ponders Sharing", *Chemical & Engineering News,* v. 48, no. 49, 23 November 1970, p. 11. At the recent Atomic Industrial Forum meeting, according to this article, AEC Commissioner Wilfred E. Johnson confirmed that the Administration is considering sharing technology for enriching uranium with foreign countries. "He personally suggests making advanced gaseous diffusion technology available to friendly nations for due compensation and with appropriate security safeguards for use in large gaseous diffusion plants to be built abroad under multinational ownership and control." He also proposes looking into turning over the gaseous

diffusion technology and the highly classified gas-centrifuge technology to U.S. industrial interests. Though enriched uranium is currently not in very great demand, projections indicate that demand will exceed production no later than 1981. Because "large blocks of electric power have to be committed six years before the plant starts to operate . . ., commitments of hundreds of millions of dollars must be made soon".

7060. "Route for Sea-Level Panama Canal will be Recommended Soon", *Engineering News Record,* v. 185, no. 21, 19 November 1970, p. 7; and "New Panama Canal will Spark Hot Debate", *Engineering News Record,* v. 185, no. 22, 26 November 1970, p. 11. "After six years and expenditures of more than $21 million, the Atlantic-Pacific Interoceanic Canal Study Commission is expected to recommend a route for a new sea-level Panama Canal. The selected route reportedly runs across the isthmus in Panama 10 miles west of the present Canal Zone . . . Already, the group has ruled out use of nuclear devices to excavate the canal, which is expected to cost from $2 billion to $3.5 billion. Anticipated obsolescence of the present canal, which already cannot be traveled by most aircraft carriers and super tankers, originally led to the establishment of the study group. It is headed by former Treasury Secretary Robert B. Anderson. Implementation of the report must be determined by the President and Congress." Opponents of the sea-level canal argue that mixing of the oceans could have serious ecological consequences, and that the present canal could be improved. The Commission was expected to recommend a completion date of 1990, with the U.S. operating the new canal while Panama retains full territorial rights.

NATIONAL DEFENSE

7061. Russett, B. M., *What Price Vigilance? The Burdens of National Defense,* Yale University Press, New Haven, Conn., and London, 1970, 261 pp. ($2.45, paper). "For the past two decades, the United States has spent more on defense than ever before in its history, except for periods of all-out war." This book presents "facts and figures on some of the causes and effects of our large and expensive military establishment. After reviewing the steady growth of defense spending since the early days of the Republic, Mr. Russett takes a close look at such relevant factors as patterns of congressional voting on defense expenditures and on related political issues; relationships between Department of Defense spending by state and the behavior of senators; the role of alliances in the sharing of military burdens; the costs to the nation; both present and future, of a high level of military spending; and, for comparison, defense spending and the allocation of costs in other countries, particularly Britain, France, and Canada. Throughout the study, he uses selected quantitative indices

and . . . statistical procedures. He . . . refutes here the charge that quantitative social science has nothing to say about the really important issues of American politics."

7062. "Blue Ribbon Defense Panel Report Considered for Potential Impact on Research, Development", *Army Research and Development*, v. 11, no. 6, September-October 1970, pp. 1, 3, 46-51. This article consists primarily of extracts relevant to defense R&D, taken from a 237-page report (see below) prepared by a Blue Ribbon Defense Panel which delved into all DoD operations and proposed some sweeping changes. The Panel was chaired by an insurance executive and contained 15 members including university faculty personnel and administrators, industrial leaders, a union official, a publishing executive, an attorney, and the Commissioner of Professional Football. The 23 specific Panel recommendations are spelled out in detail by number in the article. Recommendation 3 is of special interest to DoD groups concerned with R&D and materiel procurement. It states, "The Deputy Secretary of Defense for Management of Resources should be delegated responsibility for the following functions: (a) The Military Departments, which should continue under the immediate supervision of their secretaries; (b) Research and Advanced Technology; (c) Engineering Development; (d) Installations and Procurement; (e) Manpower and Reserve Affairs; (f) Health and Environmental Affairs; (g) Defense Supply Agency; and (h) Advanced Research Projects Agency. There should be an Assistant Secretary of Defense for each of the functions (b) through (f) inclusive . . . The position of Director of Defense Research and Engineering should be abolished . . . The Advanced Research Projects Agency should be delegated the responsibility for all research and exploratory development budget categories." According to the article, "defense agencies have their top experts . . . hard at work preparing their own detailed . . . comments on the report". (The *Report to the President and Secretary of Defense on Department of Defense by Blue Ribbon Defense Panel, July 1, 1970, defense for peace* is available from the U.S. Government Printing Office, Washington, D.C. 20402. Price: $2.25.)

7063. "Disarmament Research", *Science*, v. 170, no. 3960, 20 November 1970, p. 836. "The National Academy of Sciences (NAS) has announced a 3-year program of grants to support doctoral dissertation research in the social and behavioral sciences related to arms control and disarmament. Funds are provided by the U.S. Arms Control and Disarmament Agency (ACDA). The grants committee hopes to attract a wide range of historical, experimental, theoretical, and observational approaches to the problems of international conflict and arms limitation. Further information may be obtained from the Division of Behavioral Sciences of the NAS, National Research Council, 2101 Constitution Avenue, NW, Washington, D.C. 20418."

7064. **"Gas and Germ Warfare Renounced but Lingers On"**, *Nature*, v. 228, no. 5273, 21 November 1970, pp. 707-708. This editorial reviews the U.S. position with regard to chemical and biological warfare (CBW), suggesting that various forces conspired to delay the President's submission of the Geneva Protocol (banning first use of CBW agents in war) for Senate approval and are preventing the Senate Foreign Relations Committee from beginning hearings on the subject. Further evidences of "dissention" within the Administration are discussed: (1) plans for destroying present stockpiles of biological weapons, as announced by the President in 1969, are bogged down; (2) the approved transfer of Fort Detrick, the Army's chief biological research center, to the National In tiutes of Health for peaceful uses is being held up – possibly for financial reasons; (3) though a "high White House official" announced in February that further classified CBW research would be unnecessary, an Army spokesman said recently that some of the defensive research would have to be classified; (4) the Army requested $23.2 million for CBW research in FY 1971, which is *more* than the $21.9 million spent in FY 1970; and (5) though the United Nations voted 80 to 3 to include tear gas and herbicides in the Geneva Protocol, the Administration contends that they should be exempted, and a "bruising debate" is shaping up on this matter in the Senate.

8000 MULTINATIONAL SCIENCE ACTIVITIES

WORLD ENVIRONMENT

8167. Zimmerman, M. D., "Pollution Technology – What They're Doing Overseas", *Machine Design*, v. 42, no. 9, 26 November 1970, pp. 20-30. "Confronted with a hazy area and frustrated by a lack of clear-cut solutions, the U.S. is beginning to look abroad for new ways to fight pollution. Designs for cleaning air, treating water, and getting rid of solids in many other nations are sufficiently advanced or unique to prompt the U.S. to study, copy, and import the technology. The exchange is sometimes two-way, resulting in a cross-fertilization that improves worldwide abilities to cope with pollution. A roundup of pollution-control designs, this article reports developments from 20 foreign countries which can be viewed as technology on tap for solving our pollution crisis."

8168. "The Major Source of Air Pollution", *The OECD Observer*, no. 48, October 1970, pp. 13-14. Three actions planned by the OECD's (Organisation for Economic Co-operation and Development) new Joint Group on Air Pollution from Fuel Combustion, representing the Committee on Environment (see Abstract 8178), the Energy Committee, and the Special Committee on Oil, are described: (1) obtaining accurate data on pollutants currently being emitted from stationary power sources to provide "a first international index of the degree to which each country is contributing to the overall pollution problem"; (2) predicting the pollution levels in 1980 to enable countries to plan remedial measures, and setting forth options for such measures; and (3) recommending "measures – fiscal and other – governments can take to encourage firms and individual households to adopt solutions which seem economically and technologically most feasible. With this information systematically set forth for all the OECD Member countries, the way will be open for joint action such as the setting of common standards for permissible levels of pollutant emission, joint research and development of control techniques or new ways of removing pollutants from fuel. Whatever steps are taken by individual countries, international co-operation will be necessary to ensure that no nation is placed at a competitive disadvantage because it takes effective measures of control nor rewarded for contributing unduly to the total environmental pollution of the planet."

8169. Daniels, G. M., "SST Environmental Effects: Some Considerations", *Astronautics and Aeronautics*, v. 8, no. 11, November 1970, pp. 22-25, 80. Possible climatic changes resulting from the water vapor, carbon dioxide, carbon monoxide, nitric oxide, and dust deposited in the lower stratosphere by a fleet of supersonic transports

are analyzed. Calculations based on 400 to 500 SST's all operating in the 45 to 60-degree N. Latitude region indicate that under certain combinations of natural climatic cycles and SST water vapor effects, weather patterns could be altered or biological effects could occur. "However, if concentration of SST flights in a given latitude belt could be avoided or if the flights were made in stratospheric regions where residence times [of SST emissions] were short – say, a few months – it would seem that the expected SST effects would be reduced to a level to which it would be difficult to attach significance." On this basis, Daniels suggests that limitations on flight-path density should be considered when evaluating the economics of SST operations.

OCEAN POLICY

8170. Padelford, N. J., *Public Policy for the Seas*, M.I.T. Press, Cambridge, Mass. and London, England, Revised Edition, 1970, 338 pp. ($5.00, paper). The ten chapters of this volume discuss major facets of U.S. policy toward the oceans: New Goals for National Policy; Territorial Waters and Contiguous Zones; The Continental Shelf; The Seas and International Law; Living Resources of the Sea and Their Regulation; Mineral Resources and Their Exploitation; Pollution of Waters; Safety of Life at Sea; Models for the Future; and Political Process and the Future of National Ocean Policy. The Marine Resources and Engineering Development Act of 1966 inaugurated "a fresh set of active goals regarding the use of ocean resources. These include expanding the knowledge of the ocean frontier; enhancing commerce and navigation on it; rehabilitating commercial fisheries; encouraging private investment for exploration and development of mineral wealth of the seas; advancing education and training in marine science and engineering; and improving the capabilities, performance, and use of vehicles and instruments for exploring the marine environment with the intent of recovering its resources and utilizing its energies."

MULTINATIONAL SPACE ACTIVITIES

8171. (1) Fink, D. E., "British Reject Post-Apollo Participation", *Aviation Week & Space Technology*, v. 93, no. 19, 9 November 1970, p. 19; (2) Verguese, D., "European Space Research Totters", *New Scientist*, v. 48, no. 727, 12 November 1970, p. 324; (3) "Space Brinkmanship", *New Scientist*, v. 48, no. 727, 12 November 1970, pp. 310-311; (4) "More Confusion in Brussels", *Nature*, v. 228, no. 5272, 14 November 1970, pp. 596-597; (5) Fink, D. E., "Europe Tries to Patch Space Cooperation", *Aviation Week & Space Technology*, v. 93, no. 20, 16 November 1970, pp. 25-26; (6) "European Space Research in the Melting Pot", *Nature*, v. 228, no. 5273, 21

November 1970, p. 706. These six editorials discuss the implications of the failure of the member nations of the European Space Conference (ESC) to reach agreement in Brussels on combining their Space Research Organization (ESRO) and their Launcher Development Organization (ELDO) into a unified agency, or on participation in the U.S. post-Apollo program. Creation of a combined organization was deferred, pending agreement on a future European space program. Belgium, France, and Germany were in favor of joining in the U.S. shuttle program, and at the same time continuing work on the Europa 3 launcher as a means of insuring a future independent launcher option for Europe if the post-Apollo program fails or is significantly delayed. (The U.S. has given Europe written assurance it will launch future applications satellites which do not conflict with existing international agreements, if Europe participates in the shuttle program.) However, the British said they would not invest in the NASA program because it is "too loosely defined", and Sweden and Denmark also renounced post-Apollo participation. Italy, Holland, Switzerland, and Norway said they were still interested; though without the expected British contribution of around $250 million, the European share over the next 10 years (including the Belgian, French, and German allotments) would have to be significantly less than the $1 billion or so requested by the U.S. As a result of the unresolved dissension in Brussels, the future of the ESC and indeed of the whole unified European space program remains in considerable doubt. No date has been fixed for a new conference, though "several countries are quietly trying to organize another ESC meeting" with sufficient advance preparation to avoid the types of stalemate reached at Brussels. The Swiss have offered to act as hosts.

8172. "New Satellite Consortium", *Nature*, v. 228, no. 5271, 7 November 1970, p. 494. Seven companies are pooling their talents in a new European satellite consortium to strengthen chances for a large share of the European space business (including possible work on the U.S. Shuttle program), as well as for satellite contracts from countries like India, Australia, and Canada. "Capabilities range widely through aerospace technology, telecommunications and electronic systems... Chairman of the managing board, appointed for a year, is Commander D. W. Malim of the [British] Marconi Space and Defence Systems." The other six members of the consortium are the French Société Nationale Industrielle Aerospatiale (SNIAS), Etudes Techniques et Constructions Aérospatiales (Belgium), Société Anonyme de Telecommunications (France), Messerschmitt-Bölkow-Blohm and Siemens (West Germany), and Selenia (Italy).

8173. Hanessian, J., Jr., "International Aspects of Earth Resources Survey Satellite Programs", *Journal of the British Interplanetary Society*, v. 23, Spring 1970, pp. 533-557. The background, objectives,

technical features, and international ramifications of NASA's Earth Resources Technology Satellite (ERTS) program, with the first launch scheduled for early 1972, are described. International participation is faced with certain technical constraints: (1) because the initial program is necessarily experimental, nations interested in participating have to commit resources to a speculative venture; (2) with the initial ERTS data-acquisition system, the amount of information obtainable per orbit and the geographical range will be limited by the ranges of the ground stations; (3) there is a shortage of trained photointerpreters, so that nations wishing to participate would be expected to pay for salaries and training of their own personnel to convert images obtained by the satellite into useful data; and (4) each participating nation would "have to develop some sort of management structure to implement the program within its own borders". Some desirable consequences of international cooperation in the ERTS program are improving international relations, strengthening international organizations working for global benefits, facilitating the transition from experimental to operational stages, and alleviating fears that earthward-looking satellites with remote sensors would be exploited for economic and/or military intelligence. It is pointed out that interested developing nations should be encouraged and helped to prepare for participation in ERTS. The article concludes with descriptions of several possible forms of international participation and a discussion of possible participation by the U.S.S.R. (This paper is available as Reprint No. 8, June 1970, from the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. 20006.)

8174. Hanessian, J., Jr., and Logsdon, J. M., "Earth Resources Technology Satellite: Securing International Participation", *Astronautics and Aeronautics*, v. 8, no. 8, August 1970, pp. 56-63. Much of the information in an earlier paper by Hanessian (see Abstract 8173) is repeated in this article, which presents a historical account of the Earth-Resources Survey (ERS) satellite program with emphasis on making its benefits available to interested nations throughout the world. Some U.S. proposals placed before the Political and Security Committee of the UN General Assembly in December 1969 include offers to (1) provide technical guidance and training to member states wishing to conduct aircraft-based sensing programs; (2) stage an international workshop on ERS systems in the spring of 1971; (3) expand NASA's international fellowship programs to include courses at U.S. universities on the fundamentals of remote sensing; (4) provide briefings and exhibitions on ERS techniques for UN members and specialized agency representatives; and (5) assist potential ERS users to examine their needs and problems and evaluate ways of approaching their data processing, interpretation, and dissemination. The authors state that widespread international involvement in the

ERTS program would simplify the tasks of national and international policymakers in implementing a global system that would serve the needs of many nations of the world. (This article is available as Reprint No. 10, September 1970, from the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. 20006.)

8175. "Intelsat Subcontracts Won by 7 Countries", *Aviation Week & Space Technology"*, v. 93, no. 19, 9 November 1970, p. 22. The International Telecommunications Satellite Consortium (Intelsat) has placed a second order with Hughes Aircraft for four commercial communications satellites. The first four-satellite order, totalling $72 million, of which about $20 million was subcontracted internationally as a condition of Hughes' contract award, is nearing completion. The second order will cost only $33.9 million, since the original R&D and the test and support equipment will not have to be duplicated. Subcontracting on the second order totals about $3 million, spread among seven of the 77 Intelsat member countries: U.K. (British Aircraft Corp.), France (Thomson-CSF), Italy (Selenia S.p.A.), Japan (Nippon Electric Co.), Germany (AEG-Telefunken), Canada (Northern Electric Co.), and Belgium (ECTA S.A.).

COOPERATIVE AIRCRAFT PROGRAMS

8176. "BAC 3-11 and European Airbus", *Nature*, v. 228, no. 5271, 7 November 1970, p. 496. This article discusses the advantages and disadvantages of Britain's rejoining West Germany, France, and Holland in the A-300B (250-seat medium-range airliner) project which she left in 1968 when it seemed to be getting too expensive. The alternative is to back a rival airbus, the BAC 3-11, being developed by the British Aircraft Corp. One incentive to rejoin is the fact that it would strengthen Britain's chances of acceptance into the European Common Market. Another is that it would require a considerably smaller initial capital outlay to participate in the A-300B program than to back the BAC 3-11. The latter is a short-to-medium-haul aircraft powered by Rolls-Royce engines, and the government would have to pay half of the $360 million cost of airframe development and all of the $180 million cost of engine development. Rolls-Royce, which is in financial difficulties, would fare much better providing all of the engines for the BAC 3-11 than it would accepting the $25 million offer by the Eurobus partners to develop an optional alternative engine to General Electric's CF6-50A engine for the A-300B.

INTERNATIONAL SCIENCE ORGANIZATIONS

8177. "Makings of a New Structure", *Nature*, v. 228, no. 5274, 28 November 1970, p. 796. The Commission of the European Economic

Community (EEC) has recommended the formation of two new science groups to control R&D inside the EEC. Pointing out that the present decision making machinery is "top-heavy" and that the EEC has no common research policy, the Commission proposed a European Research and Development Committee (CERD) for planning and programming various scientific projects, and a European Research and Development Agency (AERD) for implementing them. Euratom and the EEC's Joint Research Centre (consisting of four research establishments) would be merged into AERD. "The Commission is intending to ... bring in new fields of research which demand urgent community action" (e.g., in materials for industry, medical research, meteorology, oceanography, and environmental control).

8178. **"A New Environment Committee"**, *The OECD Observer*, **no. 48, October 1970, p. 14.** "A new Environment Committee has just been created to enlarge the scope of OECD's work in this field. Until now the Organisation has mainly been concerned with the management of technological problems and with environmental resources in specific fields – water, air, pesticides, transportation, noise and urban development. Now, in accordance with a decision taken by OECD's Council meeting at Ministerial level last May, emphasis will be put on the economic and trade implications of environment policies and, in particular, on the latter's relation to quantitative and qualitative economic growth, as well as on the managerial aspects of the problems. The stress will be on promoting concerted solutions to problems having substantial international implications. Because of the complexity of environmental problems the Committee's approach will be multidisciplinary, encompassing not only scientific and technical developments but also their economic, financial and social consequences: environmental problems will be considered as a total system related to economic and social development."

8179. **"Threats and Promises of Science"**, *Science Policy News*, **v. 3, no. 2, November 1970, pp. 35-36.** "'Threats and Promises of Science', an international conference workshop, took place at Imperial College, London, between 19 and 25 July. The object of the meeting was to investigate the role of science in the resolution of problems of human welfare and to examine the relationships between science and society. It attempted to explore the prospects for co-operation across the barriers of nations, disciplines, generations and ideologies... An international seminar is planned for July 1971, and this itself is part of a larger international study-project on alternative futures of mankind. The conference was strongly international in character with representatives from some 15 countries, including Austria, Belgium, Brazil, Britain, Denmark, France, Holland, Germany, India, Poland, Sweden, and United States... The conference was sponsored by

Pugwash, the British Society of Social Responsibility in Science, and the World Federation of Scientific Workers. The conference discussed the widespread poverty and grossly unequal distribution of wealth in the world; the population explosion and attendant escalation of problems of social and material wellbeing; the increased production and destructive capacity of weapons of all kinds, nuclear, chemical, biological and 'conventional' and their growing accessability even to small states; the growth of urban and industrial development and consequent mechanisation and bureaucratisation of life; the ill-considered use of natural resources, exhausting the supplies for future generations; the disturbance of subtle ecological balances in the total environment; the ideological and semantic barriers to vital dialogues between individuals, groups and nations; and the lack of optimistic and acceptable alternatives to these present trends, which could stimulate man's creative capacities in his confrontation with the future."

8180. Higginson, J., "International Research: Its Role in Environmental Biology", *Science*, v. 170, no. 3961, 27 November 1970, pp. 935-939. This paper delves into the effects of environmental pollution on human health, pointing out that to fill in the numerous blanks in our knowledge "studies on several population groups are essential, involving the most sophisticated techniques possible. The logistic and political problems associated with such studies, especially in developing countries, and the high cost of modern environmental biological investigations make it particularly desirable to avoid unnecessary duplication and waste of resources. For certain investigations an international research center would appear to have considerable advantages, provided that the organizational difficulties can be overcome. Not only can such an organization provide the human data necessary for calculating the balance between the benefits and harm of a given course of action but also it may stimulate the long-term routine laboratory studies so necessary as a basis for extrapolation from animals to man."

TECHNOLOGY TRANSFER

8181. Krieger, J. H. (Ed.), "Technology Transfer: Probing the Assumptions", *Chemical & Engineering News*, v. 48, no. 49, 23 November 1970, p. 45. This editorial suggests the need for a more penetrating look at the concept of transferring technology from developed to developing countries in order to industrialize the latter and thereby raise their standard of living. "It is generally held that the future stability of the world depends heavily on narrowing the gap between the haves and have-nots." One of the participants at a recent conference on technology transfer is quoted as questioning whether technology transfer is "even possible under existing conditions.

Western science and technology grew out of a particular cultural, religious, linguistic, philosophical value system"; and the speaker points out that a deeper understanding of the problems of developing countries is needed before one can be sure that this type of science and technology is directly transferable to peoples with vastly different values.

9000 SCIENCE POLICY ABROAD

ARGENTINA

9038. *Science Policy and Organization of Scientific Research in Argentina*, Science Policy Studies and Documents, no. 20, UNESCO, 1970, 136 pp. This report, prepared by the National Council of Scientific and Technical Research of the Republic of Argentina, consists of seven main sections, depicting: the historical development of scientific research in the natural sciences as well as in related fields; the organizational framework for scientific and technical research; information on the financing of research; human resources devoted to research and higher education; an analysis of the educational system; a study of the present and future demands for university graduates in scientific disciplines; and a study of Argentina's social, economic, and geographic makeup. There is an appendix in which problems related to the emigration of trained personnel are discussed, and a listing of the numerous research institutes and government agencies involved in scientific and technical research in Argentina. (The report, in Spanish, can be obtained from UNESCO Publications Center, P.O. Box 433, New York, N.Y. 10016. Price: $2.50.)

AUSTRIA

9039. "More Money for Research" and "Ministry of Science New Responsibilities", *Science Policy News*, v. 2, no. 3, November 1970, p. 31. "During current negotiations for Government expenditure under the 1971 budget, the Ministry of Science has so far succeeded in obtaining a 50 per cent increase in funds for research which will now amount to S. 150 million [$5.7 million]. In the science policy field, the new Ministry is preparing to set up a Science Council to advise the departmental head in the choice of priority areas for research and science promotion. The newly created Federal Ministry of Science and Research is responsible for the co-ordination of research planning and spending. From the Ministry of Education it takes over the science field, particularly scientific research and teaching; science and art institutions at university level, including the Austrian Academy of Sciences; the protection of monuments and museums; science libraries and documentation; the professional training of scientists, scholarships, and the promotion of student-hostel building. It is also responsible for the preparation of Government contracts, international law in the above-mentioned fields, and training and advice in technical assistance. From the Ministry of Trade it takes over matters concerning the Law for the Promotion of Research."

CANADA

9040. "Scientific Policy, Research and Development in Canada", A Bibliography prepared by the National Science Library, National Research Council of Canada, Revised to June 1970, NRC no. 11589, 1970, 112 pp. About 500 references to literature covering science policy and the role of R&D in Canada between 1935 and June 1970 are listed under eight major headings: Scientific R&D in the Federal Government, in the Provinces, in Industry, at Canadian Universities, Manpower, Scientific and Technical Information, Research Summaries, and Science in General. Liberal use is made of subheads. A combined author-title index is included. (This bibliography may be obtained from the National Science Library, National Research Council of Canada, Ottawa 7, Canada. Price: $2.00.)

9041. "Science Council Reveals All", *Nature*, v. 228, no. 5273, 21 November 1970, pp. 708-709. An open letter from the Science Council of Canada to the Canadian Association of Physists, setting forth the ills of Canadian science and some possible remedies, is discussed. Among the ills are the fact that R&D expenditures are increasing much too slowly toward the "modest" goal of 2 percent of the GNP and that barriers exist between government, industry, the universities, and the financial community. Major national programs that would cut across the boundaries would help, according to the Council. Problems with big science (tendency to be "self-perpetuating") and with international projects (political and economic) are discussed. The Council sees itself as an "arbiter between competing claims on the funds". Specific suggestions include (1) contracting more government R&D to the universities and industry; (2) providing financial incentives for innovation and improved design; (3) fostering better understanding among scientists in government, industry, and the universities, and associating applied institutes with the universities; and (4) encouraging industry to hire postdoctoral fellows to work in the plants and to send industrial scientists to the universities on sabbaticals.

DENMARK

9042. "Committees for Environmental Management", *Science Policy News*, v. 2, no. 3, November 1970, p. 31. "The six Danish Councils for Research have appointed a committee to investigate research in the field of environmental sciences and to decide which sectors require more research efforts. The nine members of the committee are at the same time members of the Danish Councils for Research. Two other committees that will treat similar kinds of problems but from governmental points of view have been appointed by the Minister of the Interior in Denmark, H. C. Toft."

FINLAND

9043. "Reorganization of Scientific Research", *Science Policy News*, v. 2, no. 3, November 1970, p. 31. "A new act concerning the organisation of scientific research came into force this year. The Ministry of Education now leads the Central Commissions which jointly constitute the Academy of Finland. There is also a National Science Council. The Commissions include a National Commission for Technology and Science. The task of the Central Commission is co-ordination and planning, including the co-ordination and financing of research and the promotion of international co-operation. It will deliver opinions, take the initiative in research projects, and give the subordinate Commissions permission to make agreements on research. The Central Commission consists of the Presidents of the Commissions, plus three members appointed by the state. The President of the Central Commission directs the activities of the Academy of Finland. At least 15 chairs in research will be founded with the Commissions by 1972."

FRANCE

9044. "National Pedagogic Institute", *Science Policy News*, v. 2, no. 3, November 1970, p. 31. "The Institut Pédagogique National, which produces and disseminates educational material, and either carries out or supervises much research, is to be replaced by two new institutions: the Institut National de Recherche et de Documentation Pédagogiques and the Office Francais des Techniques Modernes d'Education. The Research and Documentation Institute will be responsible for carrying out, or commissioning, fundamental and applied research concerning all types of education, and for assisting the research undertaken in educational institutions. It will disseminate documentation on methods and curricula, will act as 'a driving force', and contribute to the training of teachers. It will, also, keep the public informed. Its director will be M. Géminard, Inspector-General of Technical Education, at the Ministry of National Education. The Office for Educational Techniques will produce documentation on educational media, and will produce or commission teaching materials. The director will be M. Jean Raynaud, Director of Equipment at the Ministry of National Education."

9045. "Co-ordination of Science Policy", *Science Policy News*, v. 2, no. 3, November 1970, pp. 31-33. A new set of rules for coordinating French research policy is set forth in Decree No. 70-728 of 5 August 1970, the main provisions of which are presented in this article. The Minister of Industrial and Scientific Development is in charge of the coordination effort. There are three bodies involved: (1) the General Delegation for Scientific and Technical Research "shall prepare,

direct, co-ordinate and supervise the implementation of national research and development policy"; (2) the Advisory Committee for Scientific and Technical Research shall evaluate policy and may submit "opinions or recommendations concerning research structures, programmes and budgets"; and (3) the Interministerial Committee for Scientific and Technical Research, composed chiefly of Ministers of the various government agencies, "shall discuss general policy . . . [and] propose . . . the amount and distribution of all resources and means allocated by the State for civil research activities". The composition, operation, and functions of each of these three bodies are described.

9046. "Civil Aviation Budget Approved in France", *Aviation Week & Space Technology*, v. 93, no. 21, 23 November 1970, p. 23. Budget authorizations for French civil aviation during 1971 are enumerated. Of the $334.5 million allotted to civilian aircraft projects, new airport and air-traffic-control facilities, and advanced civil-transport research, the following amounts have been budgeted for the country's major civil aircraft projects: **Concorde** – $93.36 million, plus $42.3 million in loans toward starting Concorde production in France; **A-300B Airbus** – $60 million toward the medium-haul transport in cooperation with Germany, Holland, and (hopefully) England; and **Mercure** – $20.9 million toward the cooperative short-haul transport with Italy, Belgium, Spain, Switzerland, and possibly Germany, but with France providing the lion's share (70 percent) of the money. Smaller programs include $7 million for V/STOL R&D, $9 million for noise-reduction research for the Mercure, and $2 million for general R&D in the civil transport field. "Industry officials see this [latter] as the first move by the government to help industry shift from major dependence on military contracts to greater emphasis on civil projects."

JAPAN

9047. "The Energy Policy of Japan", *The OECD Observer*, no. 48, October 1970, pp. 15-18. This article is based on a Japanese memorandum prepared for an OECD (Organisation for Economic Co-operation and Development) study of Japan's extrapolated energy needs and plans for meeting them. Two factors are highlighted as important in Japan's energy policy: (1) in 1968, Japan depended on foreign sources for 77 percent of its energy needs, and this is expected to grow to 90 percent by 1985; and (2) Japan's energy industries are mainly private enterprises. Energy consumption in Japan is planned to increase by a factor of 2.5 in the next 15 years, and the government's energy policy is designed to provide industry's needs from stable sources at low cost without compromising the nation's balance of payments. Part of the plan is to use national

capital to exploit overseas oilfields to provide about one-fourth of the nation's energy by 1985. In addition, at least 30,000 Mw of nuclear-power-generating and 15,000 Mw of new hydroelectric-power-generating capacity are targeted for 1985, while coal production is expected to reach 50 million tons annually. Still, as the world's leading energy importer, Japan must promote international cooperation in the development of oil and nuclear power and stabilization of supply and demand. The Japanese Advisory Committee for Energy is studying the problem of air pollution due to sulfur in the fuels, and the government is providing incentives to restrict the burning of crude oil and thereby maintain the demand for the more expensive but locally available coal.

MEXICO

9048. "Mexico Organizes to Develop its Ocean Resources", *Ocean Industry*, v. 5, no. 11, November 1970, pp. 23-25. The history and goals of the Mexican Engineering Committee on Ocean Resources (COMIRO) are described. COMIRO is comprised of top executives from most of Mexico's technical societies, as well as key government figures, and its purpose is to guide Mexican development of its ocean resources. It consists of a 31-member technical advisory board and a board of directors. Its objectives and programs, some of which are already under way, include (1) vocational guidance through lectures and consultations designed to show the application of various disciplines to ocean engineering; (2) upgrading of national education in the field of marine sciences; (3) informing the citizenry of the importance of ocean resources to humanity, through public relations activities; and (4) collecting and disseminating information in all branches of ocean engineering. One "ambitious" project along this line is the compilation and publication of a complete inventory of the ocean resources along the Mexican coastline and in Mexico's territorial waters.

NORWAY

9049. "Research Expenditure", *Science Policy News*, v. 2, no. 3, November 1970, p. 35. "A statistical report *Investment in Research and Development by Industry in 1968* (English summary), is obtainable from the Royal Norwegian Council for Scientific and Industrial Research, Norges Teknisk-Naturvitenskapelige Forskningsråd, Box 279, Blindern, Oslo, Norge." According to this report, 81 percent of the $25.7 million 1968 research expenditures by Norwegian industry went for industrial development, 18.4 percent for applied research, and 0.6 percent for basic research. The electrotechnical industry spent the most, and the chemical industry was second. Total R&D expenditure in Norway increased by 25.5 percent between 1966 and 1968.

PAKISTAN

9050. Kidwai, A., "Pakistan Goes Nuclear", *New Scientist*, v. 48, no. 726, 5 November 1970, pp. 266-267. The present and projected power needs and resources in Pakistan are discussed. It is shown that Pakistan's energy needs today cannot be met by all available coal, gas, and hydroelectric power combined, and that the deficit is expected to grow to some 16,800 Mw for West Pakistan and 12,000 Mw for East Pakistan by the year 2000. Nuclear power appears to be the most feasible source for making up these deficits, and a start is being made with an $84 million, Canadian-backed 137-Mw plant nearing completion and a 200-Mw plant scheduled for criticality in 1975. Desalination to meet critical and growing water shortages is envisioned as an important use of nuclear power. According to the author, who edits *Science Chronicle* in Karachi, "apart from the cost and economic considerations, there happens to be the overriding necessity to go nuclear, because no country, not even the developing ones, can afford to lag behind in nuclear power technology".

PHILIPPINES

9051. *National Science Policy and Organization of Research in the Philippines*, Science Policy Studies and Documents no. 22, UNESCO, 1970, 113 pp. This report, prepared by a task force made up of 12 prominent Philippine scientists, educators, and agency administrators, describes the nation's R&D system and associated science policy. Separate sections of the report present information on: the historical background of scientific development in the Philippines; the organization of science activities; financing of in-country and cooperative research by government, universities, nonprofits, and industry; technical manpower supply, demand, training, and utilization; aims of national science policy; and the structure and machinery of government relevant to science policy. In the appendixes terms are defined; principal government research organizations are listed; extensive bibliographies of Philippine publications on science policy, technical manpower, and pertinent laws and decrees are provided. (The report can be obtained from the UNESCO Publications Center, P.O. Box 433, New York, N.Y. 10016. Price: $2.50.)

UNITED KINGDOM

9052. "Fifth Annual Report of Science Research Council (SRC)", *Science Policy News*, v. 2, no. 3, November 1970, p. 35. "The SRC reviews its first five years in its fifth Annual Report published in September 1970 (Report of the Science Research Council for the year 1969-70. Published for SRC by HMSO. Price 8s. 6d. net). It points out that this period has been one of financial stringency

leading to a sharp fall in the growth rate of the SRC budget, and partly owing to devaluation, an increase in the proportion of its funds devoted to international activities. The Council's gross expenditure in 1969-70 was over £46 million [$19 million], an increase of about 40 per cent in real terms during the five years since the Council was established. The growth rate has been diminishing in recent years, and if this trend continues the Council foresees difficulty in maintaining its capital investment at an adequate level. This stringency has reinforced the Council's policies of selectivity, since each year there have been more projects proposed to the Council which were scientifically desirable than were financially possible. The last five years have seen a rapid expansion of the universities. The Council's support of postgraduate education has kept pace with this expansion. The policy has been to favor the award of Advanced Course rather than Research Studentships, and to increase the proportion of awards in applied science and those having industrial potentiality rather than awards in pure science. Nevertheless over half the awards in 1969 were made for studentships leading to a PHD and of these 67 per cent were in the pure science disciplines."

9053. **"Towards a Policy for University Science"**, *Endeavour*, v. XXIX, no. 108, September 1970, p. 106. Principles that will govern future allocation of funds for university research in the U.K., as set forth by the Science Research Council following a thorough review of objectives and methods, are discussed in this editorial. A major objective of government-funded research will be the beneficial application of new knowledge in certain selected fields, while simultaneously "encouraging some research which seems likely substantially to broaden our scientific knowledge without necessarily achieving any immediate practical advantage . . . Interdisciplinary collaboration will be encouraged not only within and between universities, but with the Council's own laboratories, with industry, and with international bodies like CERN . . . Council stresses the fact that the progress of much fundamental research depends both on wealth created by industry and on industrially produced instruments and apparatus . . . Equally, the future of industry depends on highly trained graduates . . . The universities of the United Kingdom [must] pay close attention to the kind of graduate the world will need in the future."

9054. Hill, A., **"'Do-it-Yourself' R&D for the Third World"**, *New Scientist*, v. 48, no. 725, 29 October 1970, pp. 227-228. The downgrading of Britain's Minister of Overseas Development (ODM) and the incorporation of ODM within the Foreign and Commonwealth Office are discussed in terms of their effects on the UK's program of aid to developing nations. The work of the Intermediate Technology Development Group Ltd (ITDG), a nonprofit London organization

for helping developing countries shift from agrarian to industrial economies (with financial support from ODM) is described. ITDG "carries out research in the field, and then tests these theories in practice. On the other hand, it gathers information from all over the world on the differing types of technology best suited to developing countries and acts as a central point of information". The point is made that helping the Third World do some of its own development and manufacturing instead of spending its meager funds to import needed equipment could accelerate its capacity to fend for itself. The apparently lowered status of ODM is viewed as a possible setback to such goals.

9055. "Graduate Employment: Reversed Trends", *Nature*, v. 228, no. 5274, 28 November 1970, p. 798. Employment statistics for 1968-69 graduates from British universities, as given in *First Employment of University Graduates* (HMSO, 13s), are summarized briefly. For the first time in a decade or so, the percentage of "first degree" graduates able to find employment in the UK decreased, and an "alarming" number were still seeking jobs 6 months after graduation. "Social science graduates fared worst [percentagewise, but] ... the largest group of unemployed scientists were again chemistry graduates". There is a marked swing away from the applied sciences. "Of the 'higher degree' graduates, 41.6 percent entered into employment in the UK, but again the universities snapped up many of the graduates, either for teaching posts or for further research. Only 16 per cent of this group chose to go into industry, while 8.0 per cent took up employment overseas."

U.S.S.R.

9056. Pryde, P. R., "Victors are not Judged", *Environment*, v. 12, no. 9, November 1970, pp. 30-39. Water pollution in the U.S.S.R. is described as a very serious problem. Contributing factors are the inadequate number of modern municipal sewage treatment plants; heavy industrial waste dumping into major rivers, lakes, and the Caspian Sea; poorly defined and excessively high legal limits for discharge of waste products into water bodies; ineffective enforcement of regulations; and delays and postponement in the construction of purification facilities. Pollution control agencies and statutes described in the article have thus far been ineffective, for the above reasons. The latest policy guidelines, "Draft Principles of Water Legislation for the U.S.S.R. and the Union Republics", were published on April 29, 1970, and were to be submitted for approval to the U.S.S.R. Supreme Soviet. If passed, it will "serve as a national guideline for the enactment of specific laws governing water resource development and use, and pollution control, in each of the fifteen union republics, with whom primary responsibility for pollution prevention rests".

9057. "Soviet Housing Goal: Quantity Plus Quality", *Engineering News Record*, v. 185, no. 24, 10 December 1970, p. 15. Plans for improving the quality, increasing the volume, and stabilizing costs of housing in the 1971-1975 five-year plan are discussed. About 65 percent of the $13.2 billion annual housing investment is for housing directly funded and administered by the state. No increase in the 151 square feet per person allotment is contemplated until after 1975. Average cost is cited as $14.31 per square foot. The national housing industry has been divided into 26 construction zones, and a regional plant using local materials and 95 basic plans is planned for each zone. About 3500 architects will graduate in 1975 (three times the 1970 number). Urbanization is encouraged, and rents for new apartments will not be raised. The government's stated long-term goal is to eliminate rents altogether.

9058. "Funds Bid Bares Russian Atom Power Debate", *Engineering News Record*, v. 185, no. 19, 5 November 1970, p. 34. A recent *Pravda* article quoting A. Petrosyants, chairman of the Russian state committee for atomic energy, is discussed. Petrosyants described industrial nuclear powerplants being built in the U.S.S.R., including four thermal reactors of 1000-Mw capacity or less and two fast reactors (350 and 600 Mw). He said that these units "will permit solving all problems involved in industrial atomic powerplant operation by the mid 1970s and early 1980s... Observers in Moscow say that not only is a bid being made for more development funds, but the solutions to fast reactor problems will depend on which five-year plan provides the money; the new plan starting this spring or the 1976 to 1980 plan... One Western scientific adviser in Moscow says power production 'is behind plan, and there is probably some resentment over the allocation of large resources to a type of plant that has not proved itself competitive'."

9059. "Soviet Satellite Intercepts Appear Planned to Deter Orbital Weapons", *Aviation Week & Space Technology*, v. 93, no. 9, 9 November 1970, p. 21. This article presents evidence that Soviet Cosmos 248, 249, and 252 launched in the fall of 1968, and Cosmos 374 and 375 launched recently, were two separate successful experiments on techniques for using interceptor satellites to destroy "enemy" satellites in orbit. The objective, it is believed, is to establish "a deterrent capability against reconnaissance satellites and possible orbiting weapons. The technique, which has been largely ignored by the U.S., could become a key factor in enforcement of treaties on peaceful uses of outer space."

WEST GERMANY

9060. "Budget and Planned Expenditure up to 1974", *Science Policy News*, v. 2, no. 3, November 1970, pp. 33-34. This "Special Report"

lists the Federal-Cabinet-approved total budget for 1971 ($25,035 million – up 12 percent over 1970). It then separates out the amounts allocated to the Federal Ministry for Education and Science for schools and higher education establishments ($362.4 million), for science and research ($629.2 million), and for administration ($8.5 million). Some of these figures are further broken down into education ($24.6 million), higher education building program ($255 million), student grants ($50.65 million), grants for postgraduate studies ($14.1 million), central science organizations ($80.6 million to the German Research Association and Max Planck Society), nuclear research and technology ($295.3 million), aerospace research ($126 million), data processing ($58.7 million), and new technologies ($25.9 million). In each category, the Ministry's 1971 budget is compared with 1970 allocations, and expenditures are projected to 1974. The Ministry's total budget shows consistent growth from 4.7 percent of the total Federal budget in 1969 to a projected 9.6 percent of the total Federal budget in 1974. Dollarwise, the figures are $989.6 million in 1969 to $3,050.2 million projected for 1974.

9061. Marks, D., "Disquiet Over W. German Reactors", *New Scientist*, v. 48, no. 726, pp. 267-268. West Germany's ill-fated plans for the development of a sodium-cooled fast-breeder power reactor, involving the design and construction of a 300-Mw prototype (KNK), a high-performance test reactor (FR3), and eventually a 1000-Mw demonstration reactor, are described. Owing to numerous technical difficulties with fuel elements and materials, the KFK project fell well behind schedule. Also, some doubts were emerging about the safety of such reactors and the wisdom of choosing sodium over steam or helium as the coolant. Consequently, permission for construction of the KNK reactor was withdrawn. The author suggests that the enormous financial risks involved in such projects make it desirable to consider carrying them out as international cooperative ventures. He also points out the dangers of governmental departments' utilizing expert advisers who have vested interests in a project and are thus prone "to make overoptimistic predictions".

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